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THE REHABILITATION OF PATIENTS TOTALLY PARALYZED BELOW THE WAIST, WITH SPECIAL REFERENCE TO MAKING THEM AMBULATORY AND CAPABLE OF EARNING THEIR OWN LIVING*

II. Control of Urination

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EVERY patient who has sustained an injury to the spinal cord, conus or cauda equina and is intelligent and co-operative has the right to expect infallible twenty-four-hour control of urination by the time he leaves his physician's care. Only those whose bladders have been denervated because of bilateral destruction of the parasympathetic plexuses or the lower four sacral segments or roots need any extraneous aid. Their numbers are negligible among civilians. Control of urination is an essential preliminary to self-support. No one will either walk abroad or be able to hold a job if he smells or if his clothes are wet with urine. There is no third choice between twenty-four-hour control with ambulation and self-support and a uriniferous aura with constant invalidism — usually in an institution — at the expense of the patient's family or the public.

It is the purpose of this paper to present evidence that therapy of the proper kind, properly applied with perseverance and patience over a sufficiently long time, will assure this end result to all such patients. No discussion of the details of the technic of treatment will be offered at this time. This will be considered by itself in a subsequent communication.

MATERIAL

One hundred and twenty-five patients have been selected for this study from a group of 243 with injury to the spinal cord, conus or cauda equina. Every segment of the cord from the fourth cervical to the tip of the conus and all parts of the cauda equina are represented. One hundred and one of these 125 patients were chosen, first, because they had lived long enough — that is, one month or more — after the injury to permit some conclusions to be drawn as to the efficacy of the therapy; second, because a sufficient number of cystometrographic observations were made to verify the actual physiologic state of response of the bladder at frequent intervals; third, because all had become stabilized at an end point in so far as the genitourinary system was concerned. In addition, 24 patients in whom tidal drainage was either not needed or not used are included for comparison.

Thirty-one patients had an injury of the cervical cord, 49 of the dorsolumbar cord and 9 of the sacral cord and conus, whereas in 36 the cauda equina was damaged (Table 1). The patients with an anatomic transection had a total sensory and motor paralysis below the level of injury, with a complete severance of the cord and total separation of the cut ends. Those with a physiologic or functional transection had a total sensory and motor paralysis below the level of injury, but a small vestige of neural tissue bridged the gap and the transection, although physiologically complete, was not anatomically so.

TREATMENT

Any treatment that leads to infallible twenty-four-hour control of micturition and meets the criteria listed at the opening of this paper must be considered satisfactory. I am not aware, however, of any procedure except tidal drainage that does this. Except where otherwise noted, this method was used as the fundamental therapy of the genitourinary tract in all cases reported herewith. Bladder stones, when present, were crushed intravesically. In the earlier cases, this was done without preliminary preparation. In the later ones, litholapaxy was postponed until after a period of bladder irrigation with Solution G.[1] Frequent intravenous and retrograde pyelograms were made as indicated. Originally a 1:30,000 solution of potassium permanganate was used as an irrigating fluid, but this was later changed to 0.5 per cent acetic acid, and in the last year or more this in turn has been discarded for either Solution M or Solution G.[1] Many other solutions have been tried, but none of them compare in efficacy with acetic acid and the buffered

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citric acid solutions, and of these the latter are far and away the better. The only complication that has followed their use has been an occasional scrotal dermatitis when too much leakage around the catheter or lack of cleanliness has been permitted. In the male, a No. 16 or 18 Fr. soft-rubber rectal tube, held in place with adhesive-tape strapping around the penis, and in the female, either a similar rectal tube taped to the pubis or a perforated mushroom-tipped soft-rubber catheter of the same size have been used almost without exception as catheters. A Foley-type catheter has been used only rarely and has never been considered essential. The catheters have been removed, cleaned and resterilized, and replaced or a new one has been substituted once a week, at which time a urine culture[2] has been made. For the last six years no drugs have been employed to sterilize the urine. In the earlier cases many different ones were tried by mouth, intravenously and in solution for use in the bladder, but none of them produced any effect. The fluid intake is kept at 4500 cc. every twenty-four hours for adults with a normal circulation. This amount is scaled down to an appropriate level for children and cardiac invalids.

As soon as the activity of the bladder becomes established at a reflex level, a period of training in bladder control is begun. In patients with a transection, this produces sufficient bladder capacity so that they can go a minimum of three hours during the day and while active, and the entire night without wetting themselves or being awakened. The bladder nevertheless continues to function on the "reflex" as opposed to the "normal" level.[3] In nontransecting injuries a normal bladder results. Except in cases with a destructive lesion of the sacral cord, with a resultant denervation of the bladder, all patients, regardless of the original injury, have had either a normal or a reflex bladder at discharge and have been free of catheters and any form of urinal, as well as of the need for using tidal drainage. Contracted or shrunken bladders have been stretched to a capacity of 200 cc. before reflex emptying. Any cystitis or pyelitis that was present was cured or brought under control before attempting to start the training period. Culturable bacteriuria has been constantly present so long as the catheter was in use,[2] but it has disappeared in almost every patient and regardless of the kind of infecting bacteria following removal of the catheter and without the use of medication when either normal micturition has been established or the training period has been completed. Any operation, exhaustion, impairment of nutrition, anemia, concurrent infectious disease or surgical infection anywhere in the body causes the bladder function to regress, even to the point of becoming atonic if normal micturition has not already been re-established. Conversely, good general health and nutrition and in particular a normal blood content and circulation, together with physical activity and exercise within the limits of the patient's capacity, facilitate progress toward normalcy and controlled reflex micturition.

Experience has demonstrated that aside from intelligent co-operation on the part of the patient during the training period, the two most important factors in attaining a satisfactory end result are a knowledge at all times of the functional stage that the bladder has reached in its progress toward either complete recovery or a reflex level and the need for instituting therapy by tidal drainage at the earliest possible moment and preferably at once after receipt of the injury. The first is possible only if frequent cystometrograms[4] are made. The initial one should be made when the patient is first seen or as soon thereafter as possible. It is no more reasonable to expect to treat a case of surgical shock or circulatory collapse, for example, without a blood-pressure reading at the first visit than it is to treat the bladder of a patient with a spinal-cord injury without a cystometrogram at the earliest possible moment. The function of the bladder cannot be estimated without a cystometer any better than the state of the circulation can be judged without a sphygmomanometer. This analogy is equally true in the later stages. Until the bladder function has been stabilized at either the normal or the

TABLE 1. *Diagnoses.*

Level of Injury	No. of Cases	Transecting Lesions		Nontransecting Lesions											Tidal Drainage Not Used or Not Needed
		Anatomic	Functional	Hematorachis	Hematomyelia	Compression	Contusion	Edema	Subarachnoid Hemorrhage	Adhesive Arachnoiditis	Radiculitis	Bullet Wound	Spina Bifida	Chemical Demyelination	
Cervical	31	0	2	0	21	3	4	1	0	0	0	0	0	0	1
Dorsolumbar	49	24	14	0	3	5	0	2	1	0	0	0	0	0	6
Sacral, including conus	9	0	0	0	0	6	1	0	0	2	0	0	0	0	1
Cauda equinal	36	0	0	4	0	16	4	0	0	1	6	2	2	1	16
Totals	125	24	16	4	24	30	9	3	1	3	6	2	2	1	24

reflex level, depending on the type of cord injury, a cystometrogram should be done at least once a week, and oftener if indicated. Only in this way can the physician so adjust his therapy as to suit it to the needs of the particular bladder under treatment, and only thus can tidal drainage or any other equally effective method of treatment operate efficiently and act as a therapeutic agent.

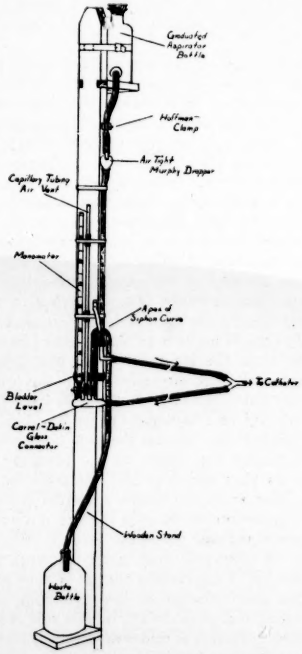

FIGURE 1. *The Tidal-Drainage Apparatus as Modified by McNeil and Bowler[8] and O. W. Stewart[6] (with built-in cystometer).*

Criticism of the use of tidal drainage in cord-injury cases has been made because of this need. It has been said that it is not worth while and that it takes too much time to go to all this trouble to make so many observations. In the final analysis, this is a matter of the amount of interest the physician has in taking the necessary steps to see that his patient gets the best possible functional end result. Failure to employ all possible means for this purpose is a criticism not of any therapeutic procedure but of the physician performing it. The modern tidal-drainage apparatus (Figs. 1 and 2),[7, 8] which has a built-in cystometer, obviates the need for setting up a special apparatus for making the cystometrograms and further simplifies collecting the required observations.

Tidal drainage as a therapeutic procedure has also been criticized as needing a specially trained technician to operate it efficiently, as requiring such constant attention as to necessitate extra ward personnel — especially at night — and as causing necrosis of the bladder.[9] It is a matter of record that the system has been effectively used in China (Fig. 3), in various clinics in the United States,[10–14] England, [6, 15–18] Canada[7, 19] and Mexico,[20] in American Army hospitals in this country[21–25] and in England[26] and on islands in the South Pacific. It has also been used on airplanes and on vessels during transatlantic crossings.[27] Lowsley and Kirwin,[12] Swartz,[19] McLellan,[10] Cone and Bridgers,[7] McCrea,[13] Thomas[14] and the United States Army[21, 24–26] in this country and Canada, as well as Robinson,[16] Stewart,[6] Kerr,[17] Wells[15] and others in England and elsewhere, have written describing its successful use. In this clinic, medical students, interns within a year of graduation from

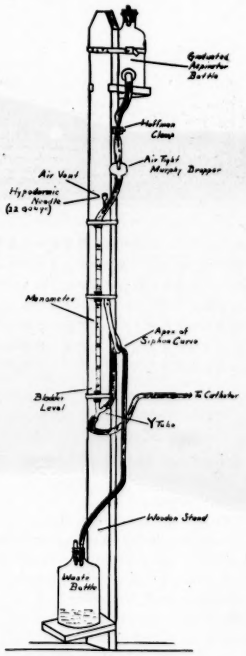

FIGURE 2. *The Tidal-Drainage Apparatus as Modified by Cone and Bridgers[7] (with built-in cystometer).*

medical school and nurses have all learned to set it up and supervise the operation with a week or ten days' training and with no more supervision than is required for any other ordinary procedure in a surgical ward. No personnel beyond the single nurse on duty at night or the usual ward staff at any other time has ever been required to care for anywhere from three to twelve patients being treated simultaneously in this way. Any trouble

脊髓膀胱 (Cord bladder) 之治療

王宏華 莫根基

脊髓膀胱之初期,大抵皮質面呈過度膨脹之現象,如膀胱不予以法,則膀胱漸形緊縮,自一九三四年孟恩氏(Munro)將連結灌洗法(Tidal drainage)應用於脊髓膀胱膀胱之後,上述症狀概可預防,不特膀胱之壁炎,可以減少而且逢病人,亦較便利,海斯塞亦不易發生。據孟氏個人四年之經驗,該項病症之死亡率,可減至百分之十強,是證連結沖洗法之於脊髓膀胱之治療,有顯著之功效。連結灌洗器之應用,組先對於各型之脊髓膀胱有個別之認

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FIGURE 3.

that has arisen has been traceable at all times to improper adjustment of the apparatus to the bladder that it was serving.

The criticism that this apparatus causes gangrene of the bladder, made by Barrington, Everidge and Morson,[9] merits more serious attention. This occurred in the course of a joint meeting of the sections of Urology and Neurology of the Royal Society of Medicine. Nothing beyond the bold statement appears to substantiate this claim. No one else, so far as I am aware, has made a similar statement, and none of the other speakers on the same program are reported to have made such a criticism. These authors made no mention of the number or type of cases that developed gangrene and were treated with tidal drainage or in any other way. No suspicion of such a complication has ever arisen in any of my 101 patients nor in any others who were similarly treated in this clinic for less than a month. The condition has never been found at autopsy when tidal drainage has been previously used nor at cystoscopy, nor has it been suggested by any clinical symptoms in the surviving patients. In the face of such experience and in the absence of details in support of their claim, this statement made by Barrington, Everidge and Morson must be disregarded, and any other conclusions drawn by them on this subject must be looked at with suspicion.

Objection has also been raised to the use of tidal drainage because an inlying catheter is necessary. It is claimed[9, 18, 23, 25, 28] that the presence of a catheter in the urethra for any appreciable time causes urethritis, epididymitis, periurethral abscesses, necrosis of the mucous membrane, strictures and so forth. It is generally agreed that the urethra is constantly contaminated and that the complications listed above are primarily the results of pressure necrosis from the catheter, with subsequent infection of the dead tissue. Interference with the drainage of the normal urethral secretions is a contributory cause. Despite this fact, a large catheter that completely fills the urethra is frequently used in males with the object of controlling leakage from the bladder. I am convinced that urethral complications only follow the use of a catheter that is *too large* or that has been inserted with the aid of a stylette (Table 2). Leakage of urine around the catheter depends not on the size of the tubing but rather on the integrity of the sphincters that surround and compress it. When closed, such sphincters assure retention of the urine in the bladder no matter what the size of the catheter that passes through them, but when they are open, leakage is inevitable despite all attempts to plug the bladder. I am certain that it is neither necessary nor good practice to use an inlying catheter larger than No. 16 or 18 Fr. If this rule is adhered to and the catheter is removed, cleaned, resterilized and reinserted in a sterile manner once a week, no urethral or periurethral complications such as those listed above will develop.

The importance of beginning tidal-drainage treatment early if complications are to be avoided and a satisfactory end result reached is apparent from Table 3. In particular, it should be noted that, whereas the genitourinary tract was infected in 98 per cent of the cases at the beginning of tidal drainage, when use of the latter was delayed until some time after the receipt of the accident, only 8 per cent were similarly infected when it was used from the first. Although 12 patients (24 per cent) developed infection of the genitourinary tract while being treated with tidal drainage, infection was present in only 8 per cent of this group at discharge, in contrast to 20 per cent in the other group and 17 per cent in the patients that had no such therapy at any time. Sixty-nine per cent of the first group had no infection at any time. That this therapy was efficient is evidenced by these figures.

Complications

The complications relative to the bladder, the urethra and the paraurethral structures that developed in this series have been analyzed in relation to their presence at the time of admission in patients in whom tidal drainage was either not begun for an appreciable interval after the receipt of the injury, was not needed or was not used when it should have been, and in relation to their recurrence during treatment by this method. It has proved impossible to determine accurately the presence or absence of pyelitis and its relation to the use of this therapy, and this complication is therefore not included. It can be definitely stated, however, that all the patients who had pyelitis during their hospital stay were free of it at the time of discharge. One patient in whom tidal drainage was begun after an interval and one who was not treated at any time by this method each had a stone in one kidney. The stones were removed by appropriate surgery. Of the 65 patients in whom complications were present before tidal drainage was used or in whom it was decided not to employ it, 6 had bladder stones, 4 a periurethral abscess, 3 epididymitis, 1 a dilated urethra, and 1 a vesicovaginal fistula. A vasectomy was performed on 1 patient. Thus, 26 per cent had complications already present before tidal drainage was started. By comparison, of the 52 patients treated with tidal drainage from the receipt of the injury, 3 had bladder stones, 4 urethritis, 1 a periurethral abscess, 1 prostatitis, and 2 epididymitis. One patient had a vasectomy. Thus, 23 per cent had complications traceable to the therapy. It is worth noting, however, that in 26 patients, 11 of whom had transections, who have come under treatment in the last six years the only complications have been bladder stones in the 3 cases just mentioned and urethritis and prostatitis in 1 case each. It has only been since the commencement of this period that the apparatus and the technic of managing it have reached a high level of efficiency. The percentage of complications in this group was 19. It is probable that this incidence can be lowered still further now that the development of bladder stones appears to be reduced to a minimum by the use of the buffered citric acid solutions (Solutions M and G).

Table 2. *Urethral and Periurethral Complications.*

Complication	No. of Cases	Cause of Urethral and Periurethral Sepsis			End Results					
		Large catheter	Styletted catheter	Unknown—present on admission	Died (cause)				Still on ward	Recovered
					Sepsis of Genito-urinary Tract	Infected Operative Wound	Sepsis from Bedsores	Miscellaneous		
Urethritis	4	4	0	0	0	0	0	1	0	3
Epididymitis	5	4	0	1	0	0	1	0	0	4
Prostatitis	1	1	0	0	0	0	0	0	0	1
Periurethral abscess	5*	0	2	3*	2	1	0	0	1	1*
(Vasectomy†)	(2)	(2)			(1)					(1)
Totals	14	9	2	3	2	1	1	1	1	8
No urethral or periurethral complications	87				2	2	3	11	4	65
Grand totals	101				4	3	4	12	5	73

*One case previously listed under "epididymitis."
†Not counted as a complication.

Table 3. *Infection of the Genitourinary Tract.*

Time of Tidal Drainage	No. of Cases	Present at Admission				Developed under Treatment				Present at Discharge (All Cases)		None at Any Time		Still under Treatment	
		No.	Per-centage	Present at Discharge	Per-centage	No.	Per-centage	Present at Discharge	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage
From the start	52	4	8	3	75	12	24	1	8	4	8	36	69	0	0
After an interval	49	48	98	8	16	1	2	1	100	9	20	0	0	5	10
Not used	24	5	21	4	80	0	0	0	0	4	17	19	79	0	0
Totals	125	57		15		13		2		17		55		5	
Averages			46		26		10		15		14		44		4

Other Methods of Treatment

A number of other methods of treating the bladder in patients with injury to the spinal cord, conus

or cauda equina have been advocated. I have been unable to find that any advocate of these alternative methods has claimed infallible twenty-four-hour control of urination as the result of their use. Even in clinics in which tidal drainage has been used,[6, 7, 10, 11, 15, 17, 19, 21, 22, 26] I am not aware of any published results in, for example, patients with transected cords that offer any better genitourinary end result than a so-called "automatic bladder." Such a bladder is in fact, and as evidenced by cystometric studies, a reflex bladder.[3] Instead of the patient's being given infallible twenty-four-hour control of micturition without the aid of apparatus, dryness and safety are secured only with the help of urinals and pads, and a night's sleep only at the cost of dangerous reduction of the fluid intake with consequent risk of pyelitis, or, when accompanied by a wet bed, frequent waking, the discomfort of rubber sheets, inability to spend a night away from home and the like.

The perennial argument whether it is better, particularly in the early stages, to permit the bladders of patients with injury to the cord or cauda equina to overflow or to empty them periodically by intermittent catheterization or by manual expression of their contents stems from ignorance of the processes by which a bladder that has been so paralyzed recovers. Automaticity is the best that can be expected from such treatment, and this can be gained only at the risk of permanent damage to the bladder wall and major infection of the genitourinary tract. This subject has been well covered elsewhere,[3, 16, 29, 30] and the discussion need not be repeated here. Proper cystometric investigation will demonstrate that none of these three methods are appropriate and that all are dangerous. If the patient is so fortunate as to acquire an "automatic bladder" this same lack of knowledge deprives him of an ideal end result, only because his physician fails to afford him the opportunity for the final training that makes the difference between a complete functional success and a makeshift near-failure.

Intermittent Irrigation

Manually controlled intermittent irrigation used alone leads at best only to an "automatic" or reflex bladder. This method has been described by Lowsley and Kirwin[12] and advised, among others, by the Medical Department of the United States Army.[24] There is no question that this method when properly used by an intelligent patient and under the direction of a careful and competent physician is the best substitute for tidal drainage. It will, without doubt, permit the development of a reflex bladder without infection of the genitourinary tract in an unknown percentage of patients with injury to the cord or cauda equina. It cannot be denied, however, that it is inaccurate, time-consuming, unphysiologic and relatively ineffective unless checked by frequent cystometric observations. A period of bladder training must follow its employment if practical useful urinary control is to be expected. I have personal knowledge of two clinics in which this method was used. In one it was a brilliant success, and in the other it was a dismal failure. The difference in results was directly traceable to the efficiency of the physicians in charge. The automatic feature of tidal drainage does away with this hazard. Next to tidal drainage, however, manually controlled intermittent irrigation appears to be the most satisfactory therapy for the cord bladder, and if properly handled and followed by bladder training it can be used instead of it.

Penile Clamp

The simplest method of urinary control in males is that associated with the use of a penile clamp. Urinary leakage can unquestionably be prevented by this means, but only at the expense of a possible dilated urethra in cases of cord injury. Whenever a reflex bladder has been established, an emptying contraction of the detrusor muscle, with associated relaxation of the internal and external sphincters, develops in response to a critical amount of stretch of the bladder wall. If a mass reflex is present, the bladder may also empty at any time and regardless of the amount of fill.[31] Once such a contraction starts, it continues until either the bladder is emptied or the detrusor is exhausted and again relaxed because of its inability to overcome an external resistance that is greater than the force of its contraction. It is this latter condition that accompanies the use of a penile clamp. The forceful expulsion of the urine from the bladder into the urethra up to the point of compression by the clamp dilates the urethra (Fig. 4) and bladder and causes puddling of the bladder urine, with cystitis and attacks of pyelitis as inevitable consequences. This can only be avoided by release of the clamp whenever such an emptying contraction occurs. Such a regimen predicates a knowledge of bladder training as referred to above and the abolition of the mass reflex when necessary.[31] Under such circumstances, a penile clamp is superfluous. Its employment is justified, therefore, only in exceptional circumstances, and then merely as insurance against failure on the part of the patient to urinate at regular intervals and in the absence of a mass reflex.

Suprapubic Cystostomy

Suprapubic cystostomy both as a temporary and as a permanent method of treating cord bladders has many advocates. Its use as a permanent method in cases of cord injury cases appears to be illogical and indefensible. Surgeons claim that when the cystostomy is properly performed the bladder does not leak. I have yet to see a patient with a cord injury whose bladder has been drained in this way who will agree with this statement or who does

not use absorptive pads around the tube and is not constantly faced with the choice of disposing of damp or wet pads or smelling of stale urine. There is the further consideration that an inlying suprapubic tube causes pain when the body is in certain positions and thus limits physical activity; is prone to rot and break in two, leaving a free foreign body in the bladder; serves as a source of irritation, infection and stone formation; fails to prevent puddling, with consequent infection of the genitourinary tract; anchors the bladder abnormally to the abdominal wall; and promotes shrinkage and fibrosis of the bladder wall, with a progressive decrease in capacity and consequent increasing uselessness of the organ as a reservoir.

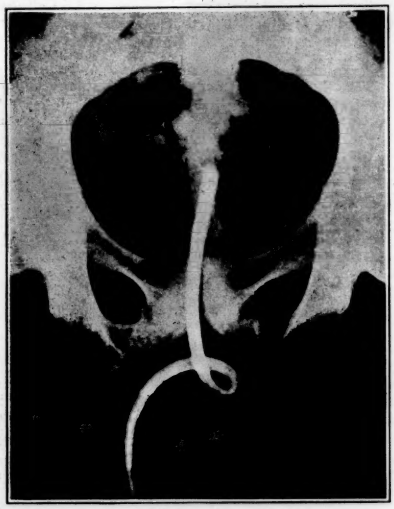

FIGURE 4. *Roentgenogram of a Dilated Urethra, with Looping and Kinking of the Catheter in the Dilated Portion. This patient had an anatomic transection of the thoracic cord and had been using a penile clamp for one month.*

The only justification for this operation as a means of treating the bladders of patients with injury to the spinal cord or cauda equina lies in the circumstances that surround combat conditions in war and the difficulties of transport that go with them. It may well be impossible to provide sufficient supervision to maintain proper catheter drainage under such conditions. Because this is essential, the lesser risk of draining the bladder suprapubically rather than by the preferable route through the urethra must be taken to avoid the greater risk of no drainage at all. There is no reason why it should be necessary to employ it, however, except in these or analogous circumstances. If it has been used, steps should be taken to close the fistula at the earliest possible moment. This should not be undertaken, however, until after cystoscopic examination with intravenous and if necessary retrograde pyelography and a study of specimens of urine from the kidney pelves have eliminated the presence of stones anywhere in the genitourinary tract, major pyelitis or pyelonephritis, encrusting or ulcerative cystitis and an occluded urethra. If such conditions exist, appropriate operative treatment of the kidney and intermittent manual irrigation of the bladder with Solution G should be carried out, and restoration of the urethral patency should be established before closing the fistula.

Such irrigation has been most effective in my hands when the fluid enters the bladder by way of an inlying urethral catheter, with the suprapubic tube kept closed until leakage takes place around the latter. In this way a maximum amount of the irrigating solution is introduced into the bladder, and at the same time the bladder wall is gently stretched and its capacity is gradually increased. Between irrigations the bladder should be allowed to drain through the catheter and not through the suprapubic opening. After these preliminaries have been completed, the suprapubic fistula can be closed.

It is undoubtedly true that almost all such fistulas eventually close spontaneously after removal of the suprapubic tube and without further local therapy, and it is customary to allow them to do so. This seems to be an extremely unsurgical method of dealing with this problem. The trouble that is saved by permitting closure in this way rather than by resorting to surgical closure with excision of the fistulous tract and surrounding scar does not justify the restriction of bladder activity that must be associated with the former method and that is reduced to a minimum by the latter one. So long as the fistulous tract is present the bladder will be anchored to the abdominal wall, which is neither anatomically nor physiologically correct.

In the group of patients under discussion, the bladder, even under the best of circumstances, works under a tremendous handicap. The more nearly perfect its anatomic and physiologic relations to the surrounding tissues, the nearer is its approach to normal function. A surgical closure and excision of the fistula and scar, with layer sutures of the bladder and overlying tissues and appropriate postoperative drainage of the space of Retzius, leaves a minimal amount of perivesical scarring and adhesion and permits maximal mobility of the bladder in the course of filling and consequent maximal storage capacity. Overstretching of the wound and leakage through the surgical incision can be prevented by constant urethral drainage during wound

healing and for a period of two weeks thereafter. At the end of this time tidal drainage can be begun, the bladder stretched to a useful capacity, and bladder training commenced in patients with transected cords after the bladder activity has become reflex or automatic. With such a background, neither the surgeon nor the patient need fear later suprapubic rupture when the bladder becomes distended.

Perineal Urethrostomy

Perineal urethrostomy need only be mentioned to be condemned. Its only advantage over suprapubic cystostomy is maintenance of drainage through the vesical sphincters. It accomplishes no more than does catheter drainage through the urethra and is as difficult to maintain under stress and with a shortage of attendants. In addition, it has all the risks that go with an open perineal wound. If it is maintained until the patient is active, moreover, the tract is sealed off whenever the patient is seated.

Rubber Urinals

It is possible for a patient with injury to the spinal cord or cauda equina to remain dry and control the urinary outflow while active by wearing a rubber urinal strapped to his leg, provided that all the circumstances are favorable and that he is willing to sacrifice his bladder as a reservoir and to regard it only as a passageway for urinary flow between the ureters and urethra. Women will not wear these devices, however, because they are not consistently leakproof, and prefer absorbent pads. When worn by men they must fit exactly around the penis if they are not to leak. Since they are manufactured only in two sizes, — one for adults and one for children, — the matter of fit depends purely on chance. If it happens that a patient is able to fit himself properly, he must be prepared to forego the use of the urinal whenever edema of the perineal or penile skin develops and alters the fit. Inasmuch as irritation caused by the constant immersion of the penis in the fumes of stale urine during periods of activity is inevitable, the usefulness and efficiency of the apparatus proves to be considerably below the level envisioned by the patient and his physician at the time of its purchase. The apparatus is difficult to clean, leaks develop easily in it, when full or nearly so it may overflow when the patient sits down, and it is useless when the patient is in bed. If the bladder is allowed to drain into it constantly, the critical level of fill, when associated with emptying of the reflex or "automatic" type, tends to decrease gradually until the bladder has so little capacity as to be useless as a reservoir. This is doubly true if the bladder is autonomous because of denervation. Proper bladder training in patients with a transected cord, supplemented in special instances by the use of a penile clamp and an inlying urethral catheter, with bladder irrigation at night by tidal drainage, will do all and more than a rubber urinal will do.

Results

The results of treatment by tidal drainage as outlined above are summarized in Table 4. They are given in terms of twenty-four-hour control of urination at the time of discharge from the clinic. Seven of the 9 patients who have control at home with the aid of tidal drainage are early cases, and today would be trained to do without this aid. The other 2 patients have denervated bladders and must use it. All 9 wear catheters constantly and have learned to clean and sterilize them and the apparatus and to remove and replace the catheter once a week in a sterile manner. One woman has been doing this for over nine years and has come to no harm. At night the patients attach their catheters to the tidal-drainage setup, but during the day they are free of the apparatus and go about with the catheter clamped off, opening it only to allow the bladder to drain at three-hour or four-hour intervals. Three of these patients were subjected to an anterior dorsolumbar rhizotomy for the relief of a mass reflex,[31] 2 being the first ones on whom this operation was performed. Three others had functional transections, 1 had a demyelination of the cauda equina, and 2 have denervated bladders. Thus, 61 of 101 patients, including 38 with transections of the cord, have complete twenty-four-hour urinary control. Thirty-five have no control, and 5 are still under treatment.

Table 5 demonstrates that in 35 patients failure to attain twenty-four-hour control was caused by

TABLE 4. *Twenty-Four-Hour Urinary Control at Discharge.*

Time of Tidal Drainage	No. of Cases	Complete Control		Complete Control with Tidal Drainage		No Control		Still Under Treatment	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
From the start	52	30	58	6	11.5	16	31	0	0
After an interval	49	22	45	3	6	19	38	5	10
Not used	24	19	79	0	0	5	21	0	0
Totals*	125	71		9		40		5	
Averages		56			7		32		4

such factors as associated sepsis, hypoproteinemia, early death, mental changes, lack of co-operation and concomitant disease, all conditions that had no direct connection with the therapy. Only 5 cases of failure (5 per cent) are attributable to the use of tidal drainage. Four of these were in early patients who were cared for while the apparatus was still being developed; they can also be eliminated from consideration. It may be concluded, then, that only 1 of 101 patients (0.9 per cent) with an injury to the spinal cord or cauda equina who had had effective therapy, were free of associated infection, were neither senile, feeble minded nor psychopathic, would co-operate and were not still under treatment failed to have twenty-four-hour control of urination at the time of discharge. This end result was obtained only because of the efficient use of tidal drainage. The chances of securing this result were somewhat better (70 as opposed to 50 per cent) when tidal-drainage therapy was begun at the earliest possible moment after the injury. Transection of the cord below the first thoracic segment, whether anatomic or physiologic, does not of itself deprive the patient of this end result.

TABLE 5. *End Results and Causes of Failure.*

Level and Type of Injury	No. of Cases	24-Hour Bladder Control	Cause of Failure											Total Failures	Still Under Treatment	Tidal Drainage Not Used
			Ineffective Therapy				Mental Changes			Other Causes						
			Ineffective Early Tidal Drainage	Associated Sepsis	Hypoproteinemia	Early Death	Senility	Idiocy	Psychosis	No Co-operation	Congenital Defect	Miliary Tuberculosis	Unknown (Tidal Drainage Effective)			
Cervical cord: Physiologic transection	2	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0
Nontransection	29	20	1	1	0	1	2	0	1	2	0	0	0	8	0	1
Dorsolumbar cord: Anatomic transection	24	6	0	6	1	2	0	1	0	2	0	0	0	12	4	2
Physiologic transection	14	10	2	1	0	0	0	0	0	0	0	0	0	3	1	0
Nontransection	11	4	0	2	0	0	0	0	0	0	0	0	0	2	1	4
Sacral cord	9	4	0	2	0	0	0	0	1	1	0	0	1	4	0	1
Cauda equina	36	16	1	0	0	0	0	0	0	0	1	1	0	4	0	16
Totals	125	60	4	13	1	3	3	1	2	5	1	1	1	35	6	24

SUMMARY

Evidence is presented in support of the contention that every patient who has sustained an injury to the spinal cord, conus or cauda equina and is intelligent and co-operative can have infallible twenty-four-hour control of urination by the time he leaves his doctor's care.

If tidal drainage is used at once after receipt of the injury and supplemented by frequent cystometrograms, the chance of obtaining this result is 20 per cent greater than if its use is delayed.

In a series of 101 cases selected from a larger group of 243 patients with injury to the spinal cord, conus or cauda equina, only 1 patient (0.9 per cent) in whom tidal drainage was properly used for a sufficient length of time failed to have infallible twenty-four-hour control of urination at the time of discharge.

I am indebted to Dr. Augustus Riley, consulting surgeon for urology, Boston City Hospital, for his assistance with this work, much of which would have been impossible without his co-operation.

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THE INTRAVENOUS GLUCOSE-TOLERANCE TEST IN LIVER DISEASE*

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THE liver plays an important role in the metabolism of carbohydrates. Clinical investigators have frequently reported observations of disturbed carbohydrate metabolism in the presence of liver disease,[1–8] and numerous studies have been made of the metabolic alterations found in experimental animals with liver damage induced either by toxic agents or by partial or total hepatectomy.[7–9]

The possibility that alteration of liver function enters into the production of the diabetic syndrome has been considered by many authors, and several reports have been published that emphasize the possible role of the liver in the etiology and pathogenesis of diabetes mellitus in human beings.

In 1939, Conn and Newburgh,[10] in an amplification of an earlier work,[11] reported their observations of glucose-tolerance curves in a series of obese patients. A majority of these patients were found to have curves of the so-called "diabetic type" following the oral administration of dextrose, and these were attributed to the excessive accumulation of fat in the liver. Conn et al.[12] and Coller and his co-workers[13, 14] reported the occurrence of such curves in patients with ascending infectious hepatitis. In their opinion, this abnormality was attributable to liver damage, and they reported a reversion of the abnormal curves to normal following surgical treatment. In the above series, the tolerance curves were determined following the oral administration of glucose.

Soskin[15, 16] has repeatedly emphasized the role of the liver in the pathogenesis of diabetes mellitus, both in experimental animals and in human beings. In 1935, he and Mirsky[17] observed abnormal oral glucose-tolerance curves of the diabetic type in certain patients with liver disease. Recently he and his co-workers[18] reported the cases of 6 diabetic patients whose conditions were aggravated by biliary infection. In 1943, he[19] published a preliminary report on abnormal curves obtained through intravenous dextrose-tolerance tests in patients with mild or early liver disease.

Many investigators have used oral glucose tolerance tests as a measure of liver function and have reported varying results.[20–22] The work reported herein was done in an attempt to determine whether there is an abnormality in carbohydrate metabolism, as measured by an intravenous glucose-tolerance test, in patients with severe liver disease and to determine whether this procedure is a valid test of liver function.

METHODS

The 25 cases from which the data in this report were obtained were studied as they appeared on the wards of the Boston City Hospital, with no attempt either to include or to exclude patients with diabetic tendencies. The only criterion for selection was clinical and laboratory evidence of marked liver damage at the time the glucose-tolerance tests were performed.

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The series consists of 21 cases of portal cirrhosis, with an additional case of possible arsenical cirrhosis as contrasted with so-called "alcoholic cirrhosis," 1 case of biliary cirrhosis and 2 cases of catarrhal jaundice in the acute phase (Table 1). Four peritoneoscopies, with biopsies in 3 cases, and a post-mortem examination have substantiated the clinical diagnoses. Four of the patients have died — afebrile after treatment for specific infections. One patient (Case 7), in whom hemolytic *Staphylococcus aureus* was cultured from both the blood stream and the ascitic fluid, was treated with penicillin. Three patients (Cases 10, 11 and 15) were treated with sulfonamides for pneumonia.

Twenty-four patients showed no urinary sugar in the routine qualitative Benedict tests done on

TABLE 1. *The Results of Intravenous Glucose-Tolerance Tests in 25 Patients with Liver Disease.*

Case No.	Sex	Age	Weight	Clinical Diagnoses	Degree of Liver Disease	Blood-Glucose Levels		
						fasting	1 hr.	2 hr.
		yr.	lb.			mg./100 cc.	mg./100 cc.	mg./100 cc.
1	F	59	?	Portal cirrhosis; serologic syphilis.	Severe	97.5	119.6	73.1
2	M	43	164	Portal cirrhosis; serologic and vascular syphilis.	Severe	48.7	129.0	87.0
3	F	51	149	Portal cirrhosis; cervical polyp.	Severe	81.0	120.6	76.9
4	F	50	160	Cirrhosis, possibly biliary	Severe	81.7	71.0	61.1
5	M	26	160	Catarrhal jaundice (infectious hepatitis)	Severe	74.4	113.6	67.3
6	M	64	127	Cirrhosis (possibly arsenical); serologic syphilis.	Severe	53.0	172.0	72.0
7	M	54	200	Portal cirrhosis	Severe	97.4	114.2	103.3
8	M	64	183	Catarrhal jaundice (infectious hepatitis)	Severe	90.9	147.5	106.8
9	M	54	143	Portal cirrhosis; Korsakoff's syndrome.	Moderate	42.5	145.0	64.0
10	M	57	160	Portal cirrhosis	Moderate	74.1	114.8	64.3
11	M	56	178	Portal cirrhosis; bronchopneumonia.	Moderate	109.0	192.0	122.0
12	M	45	135	Portal cirrhosis	Severe	86.3	150.8	72.3
13	M	64	120	Portal cirrhosis	Moderate	75.6	155.0	88.0
14	M	64	171	Portal cirrhosis; hypertrophic arthritis.	Marked	83.0	103.0	63.0
15	F	47	154	Portal cirrhosis; lobar pneumonia.	Severe	75.4	107.5	83.7
16	M	63	178	Portal cirrhosis; serologic syphilis.	Severe	132.0	148.5	124.5
17	M	61	141	Portal cirrhosis	Severe	66.5	133.0	85.4
18	M	65	137	Portal cirrhosis; serologic syphilis.	Severe	81.7	132.5	95.3
19	M	67	179	Portal cirrhosis; essential hypertension; avitaminoses.	Moderate	92.0	139.0	108.0
20	M	55	230	Portal cirrhosis; tertiary syphilis.	Severe	105.3	123.5	83.3
21	M	63	138	Portal cirrhosis	Severe	105.1	151.2	121.0
22	F	49	150	Portal cirrhosis	Severe	66.7	95.2	75.5
23	M	44	135	Portal cirrhosis	Severe	67.7	116.2	86.0
24	F	41	144	Portal cirrhosis	Severe	77.3	113.8	81.3
25	M	47	135	Portal cirrhosis	Severe	64.6	122.6	78.4

1 of bronchopneumonia, 1 of cardiac failure and 2 of hemorrhage from ruptured esophageal varices.

Clinical Evidence of Liver Disease

Of the 25 patients studied, 15 gave histories of markedly elevated alcoholic intake, 8 were moderate drinkers, and 2 denied any use of alcoholic beverages. Thirteen patients gave dietary histories of food intake adequate in vitamin content as well as in caloric value.

The general nutritional status of these patients at the time the tests were performed was judged as good in 11 cases, fair in 4 and poor in 10. No patient, however, showed either marked obesity or emaciation.

Thirteen patients had occasional low-grade fever during hospitalization, 8 were afebrile, and 4 became

morning specimens. One (Case 11) frequently had a + to ++ test for sugar in the morning urine.

The significant physical and laboratory findings that were of aid in the general analysis of the extent and severity of the liver damage found in these cases are included in Tables 2 and 3. For purposes of tabulation, the various findings have been graded from 0 to ++++ to indicate the degree of abnormality found.

Hepatomegaly was demonstrated by palpation in all but 3 cases, and in these the ascites was so marked that adequate examination of the abdomen was impossible (Table 2). Palpable spleens were demonstrated in 7 cases. For both the liver and the spleen the degree of enlargement roughly corresponded to the number of fingerbreadths that the organ extended below the costal margin. Seventeen pa-

tients had ascites, and in 13 of these paracenteses were performed. The cases in which repeated taps were necessary or in which 5000 cc. or more of fluid was withdrawn were graded as ++++. Those requiring a single tap in which less fluid was removed were graded as +++, and those in which there were physical signs of fluid but in which paracentesis was not necessary were graded as ++ or +. The patient in Case 7 had paracenteses for relief of extremely painful abdominal distention and increasing dyspnea on an average of once every two weeks over a period of fourteen months, and each tap yielded between 18 and 20 liters of fluid.

Spider angiomas, to which such grave prognostic significance has been assigned by some physicians,[23] were found in 11 cases.

A grade of ++++, indicating the extent of development of collateral circulation found in chronic hepatic damage, was assigned to only 2 patients, both of whom died from ruptured esophageal varices.

TABLE 2. *Clinical Findings.*

Case No.	Hepatomegaly	Splenomegaly	Ascites	Peripheral Edema	Spider Angiomas	Collateral Veins	Hemoglobin (Sahli)
							%
1	+++	?	++++	++++	+++	++	70
2	?*	?*	++++	+++	+	+	61
3	++++	0	+++	+	+	++	58
4	+++	+	+	++	+	+	70
5	++++	0	0	0	0	0	96
6	++++	0	++	++	0	++	83
7	++++	+	+++	+	0	+++	69
8	++++	0	0	0	0	0	92
9	++++	0	0	0	0	0	83
10	+++	0	0	0	?	0	83
11	+++	+	0	0	0	0	88
12	++	+	++	++	+++	++	77
13	++	0	0	0	0	0	87
14	+	0	0	+	++	+	85
15	++++	+	+	+	+++	++	61
16	++++	+++	++	++	0	++	56
17	+++	0	0	++	0	0	73
18	?*	?*	++++	+++	0	+++	65
19	+	+	++	0	+	+++	70
20	++++	?	+++	++++	+	++	73
21	?*	?*	++++	++++	0	+++	64
22	+++	0	++	+	+	++	70
23	+++	0	0	0	0	0	67
24	++++	0	++++	+	++	++++	44
25	++++	0	++++	0	0	+++	55

*Liver and spleen masked by ascitic fluid.

Laboratory Evidence of Liver Disease

The results of the liver-function tests performed on these patients are recorded in Table 3. Reviews of the evaluation of various such tests have recently been published by Quick,[24] Mateer and his coworkers[25] and, from this hospital, by White, Deutsch

TABLE 3. *Laboratory Tests.*

Case No.	Icteric Index[27]	Urine Urobilinogen[28]	Cephalin Flocculation[29]	Bile in Urine (Foam Test)	Formol Gel[30]	Total Plasma Protein[31]	Prothrombin Time Compared with Normal[32,33]	Hippuric Acid Excretion*[34]	15-Minute Retention of Bromsulfalein†[35]	Alkaline Phosphatase[26]
						gm./100 cc.	%	*gm./4 hr.*	%	*units*
	Normal	0–10	1:8–1:32	0–+	0	0–++	5.80–7.90	80–100	2.7 or more	10 or less	6 or less
1	35	1:64	++++	++	–		4.82	52	—	—	3.26
2	35	1:32	++++	–	–		4.89	60	2.40	—	—
3	50	1:64	++++	++	++++		5.38	75	—	90	5.09
4	50	1:128	+++	++	++++		5.41	100	—	—	18.31
5	100	1:64	+++	+++	+++		5.75	100	—	—	5.20
6	35	1:64	++++	–	++++		6.05	100	1.20	40	—
7	12	1:16	+++	–	+++		5.72	60	1.80	20	1.90
8	50	1:64	+++	++	++++		5.78	100	—	—	6.40
9	75	1:256	++	–	–		4.82	90	2.30	15	—
10	10	1:32	+	–	++++		5.32	80	0.88	10	2.90
11	75	1:64	+++	+	+		5.88	80	1.70	—	7.66
12	50	1:64	++++	++	++++		4.66	70	0.69	20	—
13	15	1:32	++++	–	0		5.09	50	—	—	—
14	75	1:64	++++	–	0		5.78	—	—	30	4.37
15	22	1:128	++++	–	–		5.02	35	2.20	40	—
16	35	1:256	++++	+	++++		5.16	52	0.80	60	—
17	35	1:256	++++	++	++++		5.60	50	—	60	—
18	15	1:4	++++	–	0		5.86	68	—	—	3.37
19	5	1:8	+	–	+++		5.70	52	1.16	10	—
20	75	1:64	++++	++	–		6.25	—	1.63	—	—
21	5	1:32	+++	–	+++		5.21	70	1.80	10	9.04
22	33	1:256	++++	++	++++		5.26	100	—	—	5.90
23	25	1:8	++	++	++		5.67	100	2.04	—	3.29
24	25	1:128	++++	++	++++		5.63	100	—	—	3.56
25	10	1:32	++++	+	++++		4.52	75	0.75	60	4.05

*Sodium benzoate (5.9 gm.) given orally.
†Bromsulfalein (2 mg.) injected intravenously.

and Maddock.[26] All such tests are standard procedures. The normal range of values, as well as references to the method used in the various determinations, are included in the table.

Gradation of the extent of liver damage as shown by the liver-function tests was from 0 to ++++. If 80 per cent or more of the tests performed gave abnormal results, the case was graded as ++++; if 65 to 80 per cent of the tests did so, it was graded +++, and if 45 to 65 per cent did so, it was graded as ++.

In addition, an intravenous glucose-tolerance test as described by Lozner, Winkler, Taylor and Peters[37] in 1941 was carried out in these patients. Urine samples collected during the test were analyzed for glucose by the quantitative method of Benedict.[38]

A total evaluation of the severity of the liver disease was determined by consideration of the clinical findings, the laboratory evidence of abnormal liver function and the course. The disease was considered moderate in 5 cases, marked in 1, and severe in 19. No mild cases were encountered.

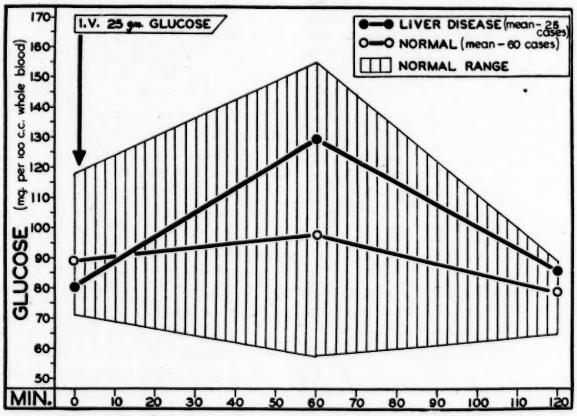

FIGURE 1. *Intravenous Glucose-Tolerance Curve in Liver Disease.*

RESULTS

The original data are presented in Table 1. The form of the curve derived from these data relating blood-glucose values to time is indicated by the heavy black line in Figure 1. The individual curves varied considerably, but the average curve fell within the range in normal subjects. There were marked differences in blood-glucose levels at each of the three time intervals, with the least degree of variation, as well as the minimum standard deviation, occurring at the two-hour interval (Table 4). This is in accord with the findings in 60 normal subjects on whom this test was performed by Lozner and his co-workers,[37] and an analysis of the curves obtained by them has been incorporated in Figure 1. In the same report they tabulated observations in a number of patients with known or suspected disease. The findings in the present study are consistent with those reported in Lozner's series for a group of 7 patients with liver disease.

To be considered abnormal, a value should differ from the normal mean value by an amount greater than three times the standard deviation of the mean.

For further analysis of the results obtained in the present study, the cases were divided into the following groups, as suggested by Lozner et al.[37]: Group A, those with blood-sugar concentrations, two hours after the injection, within the normal range, from 65 to 99 mg. per 100 cc.; Group B, those with moderate elevation of the blood sugar, ranging between 100 and 119 mg.; Group C, those with markedly elevated blood sugar, ranging between 120 and 160 mg.; and Group D, those with the blood sugar moderately depressed, ranging from 38 to 64 mg. The values in Group A differ from the normal mean established by Lozner by less than three times its standard deviation; those in Group B by more than three but less than six times; and those in Group C by more than six times. The results are presented in Table 5.

TABLE 4. *Summary of Results of Intravenous Glucose-Tolerance Tests.*

BLOOD SPECIMEN	BLOOD-GLUCOSE LEVELS			
	MAXIMUM	MINIMUM	ARITHMETICAL MEAN	STANDARD DEVIATION
	mg./100 cc.	*mg./100 cc.*	*mg./100 cc.*	*mg./100 cc.*
Fasting	132.0	42.5	81.2	20.1
One hour after injection	192.0	71.0	129.2	25.4
Two hours after injection	124.5	61.1	85.7	18.9

Four cases (Cases 7, 8, 19 and 21) were placed in Group B. Three of these were cases of portal

cirrhosis, 2 of them with severe liver damage. None of the individual curves were remarkable in contour, however, or suggestive of the diabetic type of curve.

Two cases (Cases 11 and 16) were placed in Group C. Both patients had portal cirrhosis, one with severe and the other with moderate liver damage.

Included in the cases with moderate depression in the blood-sugar concentration are 3 of cirrhosis of the portal type and the single case of biliary cirrhosis in the series. By far the greatest portion of the cases with liver disease, however, were in the

TABLE 5. *Analysis of Distribution of Cases according to Blood-Glucose Levels in Fasting Specimens and Those Taken Two Hours after the Injection of Glucose.*

GROUP	BLOOD-SUGAR LEVEL	
	FASTING	AFTER INJECTION
A (normal)	17	15
B (moderately elevated)	3	4
C (markedly elevated)	1	2
D (moderately depressed)	4	4

group showing normal blood-sugar values, both in the fasting state and two hours after the test glucose injection. This group includes 1 case of severe acute hepatitis, in addition to the cases of chronic liver disease.

Of Lozner's group of 60 normal persons, all except 1 showed glycosuria during the intravenous glucose-tolerance test, with a maximum amount of glucose excreted by any subject of 2.25 gm. In the present study, the patients exhibited glycosuria during the test in all cases except 2. The maximum total urinary glucose excreted in any one case was 2.50 gm., with an average total of 0.67 gm., showing no appreciable deviation from the normal.

DISCUSSION

Newburgh and Conn,[10, 11] in discussing their observation of diabetic-type glucose-tolerance curves in obese patients, suggest that this occurrence depends on the excessive accumulation of fat in the livers of obese patients, with resultant impairment of hepatic capacity to store glycogen. No pathologic evidence in support of these claims was offered, however, and it is known that fatty infiltration of the liver does not preclude glycogen storage[39] and that it not infrequently occurs in Von Gierke's disease.[40] In these authors' cases of ascending infectious hepatitis,[12] as well as those of Coller,[13, 14] in which diabetic-type glucose-tolerance curves were observed, the extent of the liver damage was not completely evaluated, the pathological data reported were not markedly abnormal, and the glycogen studies done on tissue removed at the time of operation were entirely within normal limits. All these studies were made by using the oral administration test method.

Soskin[18] has shown that a diabetic type glucose-tolerance curve can be obtained in completely hepatectomized dogs. It is obvious that a similar situation is never encountered in man, and the data presented here indicate that the extent of liver damage compatible with life is not sufficient in human beings to cause a marked alteration of the glucose-tolerance curve after intravenous injection of glucose. Indeed, the regulation of the blood sugar, as measured by such a test in the cases reported here, seems to be by far the best preserved of all liver functions.

In the 6 diabetic patients whom Soskin et al.[18] reported as showing increased metabolic disturbances with the development of liver disease, the initial function studies performed failed to demonstrate much evidence of liver damage, and repetition of the tests after therapy was not frequent enough to evaluate accurately any changes that may have occurred. No studies to determine liver function were reported in any of the patients who showed aggravation of their diabetic condition following therapy for liver disease, nor was any explanation offered for their relapses.

In Soskin's[19] preliminary report on the intravenous glucose-tolerance test in patients with liver disease, his findings in such cases were interpreted as showing definitely abnormal curves with a characteristic contour, and the possible use of the test as a diagnostic aid in cases of early or mild liver disease was thus suggested. Until the detailed data from which Soskin's results were obtained are available for statistical analysis, however, no accurate conclusions can be drawn.

The advantages of the intravenous as compared with the oral glucose-tolerance test are manifold.[41, 42] In addition to obviating any anorexia or nausea that may prevent proper ingestion of the test sugar, an intravenous test automatically removes such important variables as gastric motility and intestinal absorption in a test of glucose tolerance in any subject. The significance of the latter factor is well demonstrated in comparing the oral with the intravenous curves in a case of steatorrhea.[37] It seems particularly necessary to consider these advantages in studying cases of liver disease in which stasis in the portal circulation and delayed absorption from the gastrointestinal tract may conceivably cause the protracted periods of hyperglycemia following oral administration of glucose that have been reported in the literature.

SUMMARY AND CONCLUSIONS

An intravenous glucose-tolerance test was performed on 25 patients with liver disease, each of whom showed by clinical and laboratory examinations evidence of severe to moderate liver damage at the time the test was performed.

Although extreme variations appeared in individual tests, by far the greater proportion of the values obtained were within normal range.

No diagnostic value could be assigned to the tests in this series as an index either to liver function or to disturbed carbohydrate metabolism.

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CLINICAL NOTE

TREATMENT OF FRACTURE OF THE CLAVICLE BY INTERNAL NAIL FIXATION*

Report of a Case

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BOSTON

FRACTURES of the clavicle can almost invariably be satisfactorily treated by conservative measures. The fragments unite easily and quickly, and the functional results are good, even though there may be a certain amount of residual deformity and shortening of the clavicle. In an occasional case of fracture of the outer end of the bone in which it is desirable to obtain perfect alignment and retention of the fragments, the usual closed methods of treatment are inadequate. In such fractures, intramedullary fixation of the fragments by Kirschner wire has been carried out with success, but its use is not without danger, as is attested by several fatalities that have resulted from penetration of nearby arteries. In the case here presented, an operative technic with intramedullary nail fixation was successfully accomplished. It is understood that surgery of this type is not without its dangers and should be undertaken only by a qualified surgeon.

The problem presented by the fracture that lies in the outer half of the clavicle is similar to that of an acromioclavicular dislocation. The shoulder with the distal fragment is tilted downward, and the proximal fragment rides upward. In certain cases it is difficult to approximate the fragments and hold them in position. If the anatomic alignment is not maintained, the distal fragment tends to slip back and forth, carrying the periosteum down under the clavicle. Herein lies a potential danger in that a bony spur may develop under the clavicle (Fig. 1).

Case Report

A. V., a 23-year-old man, was admitted to the hospital on April 29, 1943, complaining that the left shoulder had "let go" when struck by a baseball. The roentgenographic examination showed a complete fracture in the outer half of the clavicle, with the distal fragment tilted downward (Fig. 2). Repeated attempts at closed reduction and retention of the fragments failed.

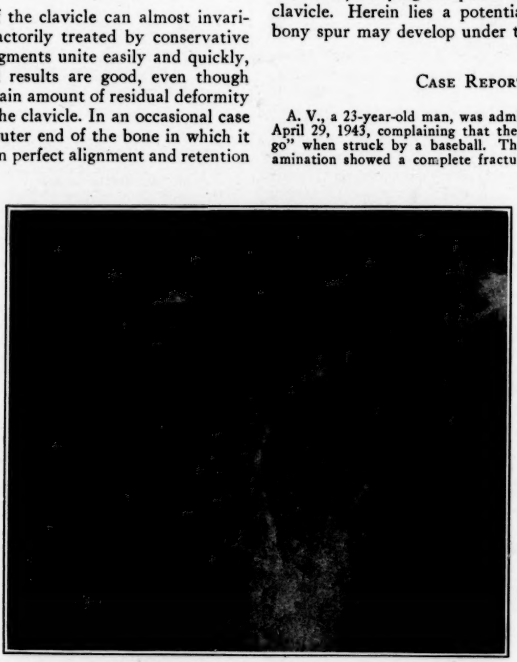

Figure 1. *Roentgenogram Showing a Bony Spur That Developed under the Clavicle following Failure to Maintain Alignment of the Fragments after Reduction.*

Operative intervention was carried out as follows. Under general anesthesia, a posterior incision running longitudinally to the axis of the bone and above its curve was made at the outer end of the clavicle. The fragments were exposed and their ends cleaned. The fragments were approximated, and bone forceps were applied to hold them in position while a nail was being introduced.

A drill hole was made in the outer end of the clavicle, after the point of entrance for the drill had been calculated by studying the position of the fracture. The nail was care-

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fully selected as to its length, so that when the curve of the clavicle was taken into account the nail would be sufficiently long to engage the inner fragment. This nail, made of stainless steel, was placed in the drill hole and driven through the medullary area of the outer fragment into the inner fragment. It was driven in completely, so that its head did not protrude.

The forceps were removed, and the wound was closed in the usual manner and without drainage. The skin was closed with endermic sutures. No retentive dressing or apparatus, not even a sling, was applied. In 4 days, the patient was discharged from the hospital. Motion was possible as soon as the traumatic reaction had subsided.

By May 17, the wound was well healed. Roentgenograms taken at that time showed satisfactory alignment of the fragments and evidence of union (Fig. 3). On June 14, the nail was easily removed through a 2-cm. incision under local anesthesia. A roentgenogram showed solid union (Fig. 4). A perfect anatomic and functional result was achieved.

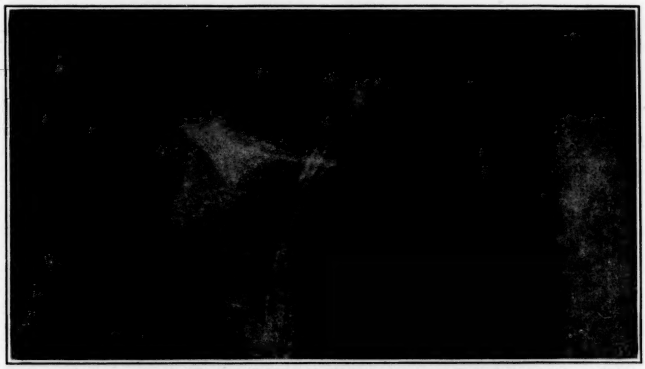

FIGURE 2. *Roentgenogram Showing Complete Fracture in the Outer Half of the Clavicle, with Displacement of the Fragments.*

The idea of using a nail in handling fractures of the clavicle is not new, although few such cases have been reported. Lambotte[1] recommended the use of a screw or longitudinal nail in transverse or slightly oblique fractures and reported sixteen such opera-

FIGURE 3. *Roentgenogram Taken Two and a Half Weeks after Operative Fixation, Showing Good Alignment of the Fragments and Evidence of Union.*

tive fixations. In all except one, the patient recovered good function and the fragments were perfectly aligned. Osteosynthesis by a nail was also proposed by Spitzy,[2] Bonnet[3] and Johnson.[4]

It has been customary to consider some form of postoperative external splinting as necessary for adequate fixation, regardless of the type of osteosynthesis, but in following the nail fixation in the present case, no external retentive dressing, not even a sling, was required.

One objection to nail fixation of fractures of the clavicle is based on the possibility of ulceration of the skin from the head of the nail. In the method herein described, the head lies in the posterior aspect of the clavicle, so that the skin is not pulled over it. Another objection is the danger of irritation of the bone, giving rise in some cases to osteitis and in others to hypertrophied callus. This danger is not encountered with this technic, because the nail is removed as soon as the roentgenogram shows solid union.

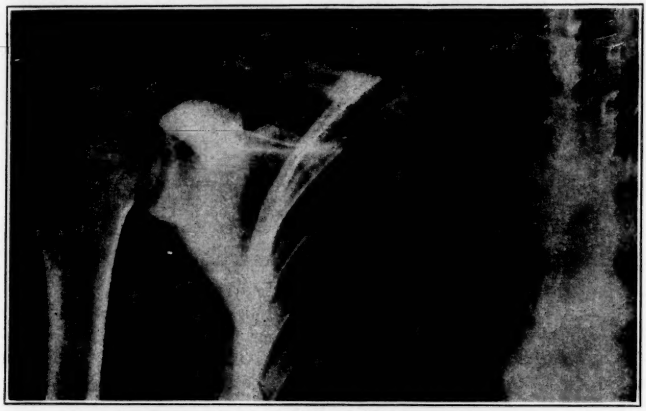

FIGURE 4. *Roentgenogram, Taken Six and a Half Weeks after Operative Fixation, Showing Solid Union.*

SUMMARY

A case is presented of a fracture in the outer half of the clavicle in which operative intervention and fixation by means of a nail were satisfactorily carried out. No postoperative dressing or splint was required. The method afforded complete comfort to the patient and permitted him to be ambulant, thereby definitely curtailing the period of incapacity.

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SYMPOSIUM ON MEDICAL SOCIOLOGY

THE POINT OF VIEW OF ORGANIZED MEDICINE TOWARD THE DISTRIBUTION OF MEDICAL CARE*

LOUIS H. BAUER, M.D.†

THE problem to be discussed is that of medical care. It is a controversial issue; in fact, if it were not so there would be no problem. I should like to appeal for a sound and sane method of approaching it. It is a problem that is comparatively recent, having developed within the last two decades. It has been brought about by the increased costs of medical care.

One of the reasons for this situation has been the increased cost of medical education, but the chief one has been the increased cost in diagnosis. After all, the physician giving the medical care receives little more money than he did a good many years ago, but the cost of arriving at the diagnosis is tremendously greater, and the result has been that there are certain persons who find it difficult to meet the economic burden of illness, particularly prolonged or so-called "catastrophic" illness. More persons go to hospitals and more have private nurses, and both these trends increase the cost of medical care.

There has been a great deal of propaganda concerning the distribution of medical care in the United States, and not all of it is well justified. For example, a so-called "National Health Survey" was conducted in 1939, as the result of which it was stated that one third of the people of the United States were without medical care. This statement is certainly not true today, and I do not believe that it ever was true. The figures were based on a survey of what was not a true cross-section of the country but a cross-section of a certain area, held in an effort to unearth chronic sickness. No effort was made to find out *why* people did not receive medical care. The survey was carried on by 6000 W.P.A. workers of high-school age who had no training whatever in what they were to do or in how to do it. I daresay that at least a third of those present did not have medical care in 1944. I did not have any myself, but it certainly was not because I could not get it. It must be remembered that many persons are not ill. Others prefer to secure medical care through patent medicines bought in drugstores. Others go to cultists, osteopaths or chiropractors, and still others, such as Christian Scientists, have religious scruples against accepting medical care. All these things must be taken into consideration. Even the survey mentioned revealed that 17 per cent of persons with incomes of over $3000 did not have medical care. Certainly, the economic factor was not the important one there.

Shortly after the results of this survey were published, the Medical Society of the State of New Jersey, by means of the radio, the press and public speakers, stated that anyone in that state who could not get medical care should immediately apply to the medical society and promised that care would be given them. Of a population of over 2,000,000, only 7 persons reported that they could not get medical care, and none of them were actually unable to do so. They simply did not know how to go about it.

The statement frequently made is that half the counties in the United States are without a general hospital. This is true, but it is not stated that of these thirteen hundred counties only thirteen are more than thirty miles from a general hospital. With good roads thirty miles is not a great distance to transport a patient. In fact, it is often easier to transport a patient twenty or thirty miles in a rural district than it is to take him five or ten miles to a city with its traffic problem. Nor is it stated that of these thirteen counties only 5 have a population of more than 5 persons per square mile.

The United States has the lowest death rate of any country in the world except New Zealand, and New Zealand can hardly be compared with the United States concerning either the character of its population or its medical problems. The rate of the United States has constantly decreased, and even during World War II, with the shortage of physicians and nurses, death rates remained surprisingly low, and those in many areas even decreased. The life expectancy has increased forty years in as many years. Infant mortality has dropped 50 per cent since 1920.

Draft statistics are often cited as showing that the American public is gradually falling apart physically. The facts are that approximately 4,000,000 men were rejected in the draft, and that of these, 800,000 were illiterate. Nearly 800,000 more were rejected because of neuropsychiatric defects. It is questionable how much medical care or lack of it had to do with the development of these conditions. Nearly 1,000,000 men were rejected on account of bad teeth, but most of them were later accepted. Between 200,000 and 400,000 men had remediable defects. A great many of these men could

*This is the seventh of a series of nine lectures on medical sociology given weekly at Harvard Medical School during January, February and March, 1945; they were sponsored by the Department of Preventive Medicine and were primarily intended for third-year students. These articles will temporarily replace the reports "Medical Progress."

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have been cured and entered the service, but they refused to do anything in that direction.

A great many men were rejected on account of defective eyesight. Here again, it is doubtful whether any amount of medical care would develop good eyesight. Many of these men might not have had such poor eyesight if they had been instructed in the proper care of their eyes in their early days; and the same thing applies to those rejected for poor teeth. Proper knowledge of dental hygiene might have saved a great many of them but the figures would probably not have been materially affected by an increase in medical care.

During the 1939 survey, a prominent weekly magazine published a cartoon showing a hut on the side of a hill, — it was nothing more or less than a few boards nailed together, — with an emaciated woman in rags, accompanied by two or three children, all practically naked. The cartoon was entitled, "These people need medical care." They did need medical care, but they needed some other things a great deal more. They needed a proper place to live and proper food and clothes. Had they had these, they would not have needed so much medical care.

I do not wish to give the impression that I think that all is well with the status of the medical care in the United States, because I do not. It needs a great deal of improvement. Owing to increased costs there are persons who cannot afford good medical care, and there are others who stay away from physicians rather than accept charity. This situation must be remedied.

The difference in opinion that exists relates to the manner in which the situation should be remedied. First of all, it must be borne in mind that there are certain areas in the United States in which good medical care simply is not available, because the area is such that it cannot support a physician or a hospital. If a physician takes up practice there, he either soon goes somewhere else because he cannot practice good medicine, or — what is even worse — stays there and practices poor medicine.

It is thus evident that the lack of proper diagnostic facilities in certain areas of the country must be remedied. There is probably no one in Massachusetts who is unable to get medical care, and this is certainly so in New York State, but not all states are so well favored.

There is also a serious lack of facilities for preventive medicine in the United States. About half the counties have no county health department. It is not necessary for every county to have such a department, but every district should have one. In sparsely settled areas, two or three counties may combine to have a district health center.

There are four economic groups in the United States. The first comprises those who are financially well enough off to meet any conceivable situation. The second includes those who can meet the ordinary costs of living and ordinary medical expenses, but find it difficult to meet those of long and expensive illness. In the third group are those who can meet the costs of the bare necessities of life but cannot meet the costs of any sickness. The fourth group comprises those who are dependent on public aid for housing, clothing and nutrition as well as for medical care.

The first and last groups require little consideration. Those in the first group can afford any type of medical care that they desire. Those in the last group in most areas are likewise well taken care of through charity hospitals and welfare departments. There are certain areas in the country in which this is not true, and that situation must of course be remedied. The other two groups are the ones that cause the most concern, being comprised primarily of those in the middle income bracket. What is the best way to meet this need? The American Medical Association believes that medical care of a high quality should be available for every person in the United States. The difference of opinion relates to how this medical care should be distributed.

Those of you who are on the faculty will recall that many changes have occurred in the therapeutics of certain diseases. They remember, as I do, the time when there was no treatment of pneumonia except bed rest and fresh air. I remember a remark made by Dr. Frederick Shattuck, our professor of medicine, to the effect that if he had pneumonia he would want to be in bed in a room with the windows open and a fire in the fireplace and to have someone feed him plenty of liquor. This, he said, was about the best treatment there was for pneumonia. Then serum was developed. It was not adopted immediately, and even after considerable experimentation it was used only gingerly. In fact, for a long time there was serum only for certain types of pneumonia. Somewhat later, the sulfonamide drugs came on the market, but physicians did not abandon the use of serum. Both were employed, and only recently has serum gone more or less into the discard. Next came penicillin, but the sulfonamides have not been given up because of it. A new system of therapeutics in the treatment of pneumonia has gradually evolved over a prolonged period. Perhaps ten years from now all these methods will be in the discard and there will be something else.

The same approach should be made to the problem of distribution of medical care. Since our nation has been made the healthiest in the world through private enterprise, why should this be abandoned for something different? Let us experiment gradually, testing various plans that have been suggested.

The medical profession has accepted the principle of insurance as one of great assistance, but it continues to believe that such insurance should be on a voluntary basis to avoid political interference and

to prevent the rendering of a mere quantity of medical care rather than care of a high quality.

In the development of any new type of insurance, it takes time to make it successful and acceptable. At present all sorts of voluntary insurance plans are under experimentation. Some of the industrial plans date back twenty years, but many of them are of extremely recent origin. Many such plans that were started by medical societies have altered their method of coverage. Some of them have failed simply because they were not on a sound actuarial basis and were not organized to deliver good medical care.

When the problem of insurance first came up, no one knew just what should be done. There was no actuarial background for any of these plans. No one knew how the public would react to the proposition or how physicians would react to it. Consequently, there was blind groping, but during the last four or five years a good deal of experience has accumulated showing some things that are good and some that are not.

The American Medical Association has been severely condemned for not proposing a voluntary plan to cover the whole United States. To my mind, this would have been the surest way of killing the whole thing, for the very reasons just stated: no one was in a position to say what the best type of plan would be, and even now we are not entirely sure. It is my opinion that there never will be a single plan that is satisfactory for the whole United States, because a plan that will work in Missouri and Arkansas may not work in Massachusetts, what will work in the city will not work in the country, and what will work in agriculture will not necessarily work in industry. So that a variety of plans are needed, and I think that this will be the answer so far as insurance is concerned.

There are persons who say that the voluntary plans will not work. Such statements are made in haste and perhaps maliciously — those who make them do not want voluntary plans to succeed because they prefer compulsory ones. Nevertheless, group hospital insurance, which is one form of voluntary insurance, has grown tremendously in the last few years. There are now over 19,000,000 persons in the United States who are covered by it. This is admittedly not enough, but in view of the increasing demand for this type of insurance, there is no reason why it should not be made available on a country-wide basis, and it probably will be. There are over 25,000,000 other persons who are covered, at least to some degree, by voluntary nonprofit medical-society plans, industrial plans and commercial plans. These plans vary from complete medical coverage to coverage only for surgery and obstetrics, and from coverage for the whole family to that for workmen only.

These plans must be made available to everyone who desires to be insured, and at a cost within his means to pay. Over half the states in the Union now have nonprofit plans, either in operation or in the throes of organization. Growth has been slow and will continue to be so, but it has been much more rapid in the last two or three years than anyone thought possible at the beginning. The public is not yet sold on the idea. There have been all sorts of surveys. They disagree on some points, but they all agree that the public is demanding some method of prepaying its costs for catastrophic illnesses, and the majority of the surveys state that the public prefers to do this on a voluntary basis if it can be so arranged. The American Medical Association is about to appoint a director of insurance to correlate these types of plans and to stimulate their growth. The only reason it has not been done already is that the proper man for the job has not been found, but he soon will be.

It has been suggested that the indigent could be covered by having the state or county or town concerned purchase voluntary policies instead of hiring a so-called "poor" physician or paying the physicians' bills directly.

The Committee on Public Relations and Economics of the Medical Society of the State of New York states that 2 to 10 cents a day per person will adequately cover both medical indemnity and hospital insurance, that a broad surgical contract costs 2 cents a day per person, that a surgical contract including obstetric care costs $1.70 a month per family, and that a liberal medical and surgical contract with obstetric care costs $3.00 a month for an entire family. Such plans are available in certain areas, but they have not yet been made widely enough available, and we are trying to see that they are.

I have said that there are some persons who contend that voluntary insurance will not work, but it has not been tried long enough for them to make any such statement. One of the reasons given is that such insurance did not work in Europe. This is an unfair comparison, because in this country no voluntary plan that is worth anything has the slightest relation to any of the so-called "lodge practices" or "friendly societies" in Europe prior to the adoption of the compulsory program.

As already stated, insurance is only one answer to the problem. Adequate diagnostic facilities must be available in every area. If the local communities are not able to support diagnostic centers, they must get subsidies from the state. If neither the local community nor the state can finance them, the federal government must do so. If diagnostic facilities are available at reasonable cost, and there is voluntary insurance as well, the problem of the cost of medical care will be largely solved.

It has been publicly stated that the American Medical Association is against this program, as it was against those proposed in 1928, 1932 and 1934, but there is scarcely anyone whose opinion has not

changed in the course of years on various problems of the day. Even as late as the summer of 1941, a large part of the population of the United States were against this country's entering the war, but it would be hard to find any red-blooded citizens who are not wholeheartedly for war now. Ideas have changed. The whole question of medical insurance was hazy twenty-five years ago. There was not the need for it then that there is now. Naturally, the American Medical Association did not sponsor any such program when the need for it was not shown.

Another piece of propaganda that is often leveled at the American Medical Association is that it is against group practice. There is a prominent doctor in Boston, a president of the American Medical Association only two or three years ago, who is head of one of the outstanding groups in the United States. Both the Mayo brothers served as president of the Association. There is a member of the Mayo Clinic who is a member of the Board of Trustees of the Association, and other examples could be cited. The American Medical Association is, however, against groups that are organized purely for profit and not to deliver a good grade of medical care, but groups as such have not been frowned on. Many such groups started after the last war, but they failed, not because of any disapproval of organized medicine but because the public could not support them. The public likes Dr. Smith but it does not like Dr. Brown, and patients will go to Dr. A but not to Dr. B.

Another point that should again be stressed is that of adequate health supervision in the way of preventive medicine for every district in the United States. There again, federal funds may be used to help subsidize the local communities that are unable to support such facilities.

For the last seventy years the American Medical Association has asked for a United States Department of Health, with a cabinet officer in charge and with the same status as all the other cabinet departments in the government. This request has never been granted, and this may not be the time to push such a proposition, because the present trend is to carry on government outside the cabinet departments. For example, the Department of Labor is hardly more than a statistical bureau, the War Labor Board settling most of the problems that would normally be handled in that department. The Department of the Treasury is largely an accounting department. The Reconstruction Finance Corporation and all the various lending agencies are grouped outside the Treasury Department. Many agencies are grouped in the Federal Security Agency, again an agency outside the cabinet.

It might be better if there were a commission to supervise the question of health in the United States, but one thing is certain: it is ridiculous that one must deal with a dozen different departments to find all the agencies connected with health. For example, the United States Public Health Service used to be in the Treasury Department but is now in the Federal Security Agency. The Child Welfare Department is in the Department of Labor. The Food and Drugs Administration used to be in the Department of Agriculture but is now in the Federal Security Agency. The Immigration Service is in the Department of Interior. The Veterans Administration is entirely independent.

One of the plans that have been suggested for solving the problem of medical care is compulsory health insurance. In the first place, this term is a misnomer. The method has nothing to do with health; it has to do with sickness. It is not insurance; it is a tax. It is in operation in a great many countries in the world, and nowhere has it given as satisfactory records as has the American system based on free enterprise.

Preventable diseases are on the increase, as evidenced in England where the diphtheria rate has gone up since the adoption of compulsory health insurance in 1911 and in Germany, where this rate has tremendously increased. In England, since the adoption of the compulsory sickness insurance act, a higher percentage of patients with far advanced tuberculosis have been admitted to sanatoriums than in the United States.

Compulsory insurance encourages malingering. Days lost by the working man increase instead of decrease. It interposes a third party — the government — between the physician and the patient; the former is responsible to this third party and not to the patient. A poor type of medical care is generated.

In England, a panel system is provided. It is not unusual for a physician to have 1000 or 1500 patients on his panel. He tries to do a little private practice on the side, and it is nothing for him to see thirty patients in the course of an hour. It is easy to see the difficulty of rendering good medical care if the procedure is to allot two minutes to each patient.

There is also a tendency toward mass medicine, and this is true throughout the various prominent experiments in compulsory sickness insurance. This was true in Germany before the war, and in this country. During the Depression, the Federal Emergency Relief Administration issued certain edicts to the various states that accepted money from the federal government to carry on medical care, and the physician was told what he could and could not prescribe. He was also told the number of visits that he could make.

The physician is extremely likely to become a certificate writer rather than a family counselor. In fact, a prominent English physician said that under the panel system the physician merely wrote certificates that would satisfy the patient, keep the physician out of the hands of the Medical Council and satisfy his tattered conscience.

Compulsory health insurance does not in any

sense reach the unemployed class, so that it still does not solve the problem of the indigent. Finally, it is inordinately expensive, and results in a tremendous bureaucracy, with the accompanying red tape and inefficiency. Voluntary insurance, on the other hand, gives either a cash indemnity or medical service that the patient can use when and where he wants it. The physician is responsible to him and not to a bureaucrat.

The most outstanding example of compulsory sickness insurance that has yet been suggested in this country is that proposed by the Wagner–Murray–Dingell Bill, which died in the last Congress but has been reintroduced by Congressman Dingell.* It has not been reintroduced in the Senate. This is an extension of the Social Security program, which is in vogue in this country at the present time. Certain Social Security provisions of this bill have already become law, such as old-age security and unemployment insurance. There are some persons who are against this trend and think that we have gone too far, but this is an idle argument. Social security is here whether we like it or not. It is going to stay and we might as well accept the principle of it. The Wagner–Murray–Dingell Bill, however, goes farther and attempts to put compulsory sickness insurance into effect throughout the country. In substance, this bill would extend social security coverage to at least 110,000,000 persons in the United States. It would deduct 6 per cent from the employee's pay up to $3000, and the employer would contribute an equal amount — a total payroll tax of 12 per cent. Self-employed persons would pay 7 per cent up to $3000. In times of full employment this tax would bring in something over $12,000,000,000 a year.

Not all this, of course, is for medical care. It is estimated that 25 per cent of the total income would be earmarked for medical care, or something over $3,000,000,000 a year.

Senator Murray has stated that there will be no politics in the handling of this money. I hope that he is right, but I am extremely skeptical about it. It would certainly shatter most precedents. This does not mean that because there are public funds there must be politics. Locally, this is less likely to occur, since the people are much closer to those who are administering the program and stand guard over it. When, however, federal funds are controlled by the federal government for a project that may be three thousand miles away, politics is bound to come in, because there are many middlemen, and a tremendous bureaucracy is built up. In Germany, before the war, there were more people working in the Health Bureau than there were physicians working for it.

This bill places full authority for administration in the hands of the Surgeon General of the United States Public Health Service, under the Social Security Board. It provides for an advisory council of sixteen, who will be appointed by the Surgeon General from lists of nominees submitted by the various professional and other organizations. Presumably there would be physicians on this panel, but there is not a single word in the bill to the effect that there *must* be a physician on the council. As a matter of fact, this makes little difference, because the council will have no authority. All it can do is to give advice, which may or may not be taken.

The bill provides for so-called "free choice" of physician, but this means free choice provided that the physician agrees to take part in it. In England, the majority of the better physicians refuse to play any part in the compulsory sickness-insurance scheme.

The bill also prescribes how and under what conditions the physician may participate. It provides for three possible methods of payment — a fee for service, a full-time or part-time salary or payment on a per capita basis.

The Surgeon General may limit the number of patients a physician may treat, and under certain conditions he may arbitrarily assign patients to a particular physician. He sets up the standards for specialists and determines who meet them, and the patient has no choice whatever in the selection of a specialist. He is authorized to determine what hospitals can take part in the program, and within the limits prescribed in the bill can determine what those hospitals will be paid. It is my opinion that limitation of payment to the amounts set forth in the bill would result in the closing of most of the voluntary and private hospitals in the country or their conversion to government control.

There is provision for certain laboratory and hospital benefits, the nature and extent of which are to be determined by the Surgeon General. The bill also provides for grants-in-aid for medical education and research, with the result that the Government will eventually control both.

American medicine has been responsible for a state of health of the people unexcelled in any other country. The enactment of this bill would result in its deterioration, for if medical education suffers, if the quality of medical care becomes attenuated and if the incentive to individual medical research is removed, the resulting harmful effect on the health of the people is inescapable. Another tremendous bureaucracy will grow up.

Another point, which has been brought out by the American Bar Association is that neither the patient nor the physician will have any recourse from regulations or decisions issued by the Surgeon General, who is not an elective but an appointive official, except to a board appointed by the authority who wrote the regulations and made the decisions. One cannot appeal even to the courts.

*These paragraphs apply to the previous version of the Wagner–Murray–Dingell Bill. The present bill (S.1606) makes no mention of taxes and does provide for court action. The principles of the two bills are the same.

I do not accept the premise that compulsory insurance is necessary, but there are those who say that it is needed for a certain segment of the population. Even if this is so, is that any reason for crowding it down the throats of everyone? Some persons are satisfied with the type of medical care that they have. A national compulsory sickness insurance program would overthrow everything that has produced the best medical education and the best medical care in the world and set up a system that has never been used in this country, and that has certainly never given any outstanding results anywhere else.

This problem can be solved by increasing the efforts on behalf of the voluntary plans, by making them widely available, by increasing diagnostic facilities and by having federal aid where this is necessary to subsidize the various districts.

As I have said before, when the answer is found it will not be a single but a multiple one. Compulsory sickness insurance is not the answer at all. The present system of medical care does need improvement, but this should be accomplished in an evolutionary manner, by increasing the number of facilities for preventive medicine and for diagnosis and making these available at a reasonable cost through hospital insurance, industrial plans, medical-society plans and what not, and by gradually evolving plans — three or four plans of different types — that will cover the whole United States.

In discussing the background of the necessity for reform, let us stick to facts and avoid propaganda. A member of the faculty of this school, in a public address, once stated his belief that organized medicine could not be trusted to handle this problem because, for example, the Medical Society of the State of New York had introduced an amendment to its bylaws that would prevent any individual or county society from initiating any policy that was in conflict with the state society's policies. He did not go on to say that when the amendment came up for consideration in the House of Delegates, it did not receive a single vote. Not even the man who had introduced it voted for it, and when I called that to his attention he said, "Well, the Council approved it." There, again, he displayed his ignorance, because the Council of the Medical Society of the State of New York cannot act on any amendment. If one is introduced, all it can do is to send it to the House of Delegates.

So let us try to make our arguments real arguments and not propaganda. Let us be willing to listen to the other man and sit down with him, and see if we cannot solve the problem in a way that is satisfactory to everyone, and that will not attenuate or deteriorate the present high standards of medical care or medical education, but if possible improve them.

Let us stick to the platform that good medical care should be available for every person in the United States. How many people are without it is not important, because if there is one person in the whole United States who does not receive it, that person is one too many. Let us find a system of distribution of medical care that is in accord with the system of free enterprise, which has made this country what it is.

* * *

In summary, the American Medical Association advocates the following: continued expansion of the practice of medicine, with full development of approved voluntary hospital, medical, indemnity, industrial and commercial insurance against the costs of medical care; the development of public-health and diagnostic facilities for preventive medicine throughout and of adequate diagnostic facilities everywhere; the use of the voluntary insurance principle in caring for the indigent and medically indigent; the development of hospital facilities where present facilities are used to the utmost and are still inadequate (there is now a bill in Congress that we hope will pass, — the Hill–Burton Bill,— which provides for building hospitals in areas lacking them and establishing diagnostic facilities; the bill is not perfect, but it is a step in the right direction); the use of federal funds to aid communities in public-health measures, care of the indigent and construction of necessary hospitals, when these communities are unable to finance the projects, but with retention of local administration; and the creation of a unified United States Department of Health, whether it be a cabinet or a commission.

Finally, let us move ahead, steadily but carefully, in a sound, evolutionary manner. We must not be stampeded into discarding and destroying what has given an unparalleled health record. Let us not forget that private enterprise has made America what it is.

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

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CASE 32071

PRESENTATION OF CASE

A fifty-four-year-old foreman entered the hospital complaining of substernal pain on exertion.

The patient first consulted his physician four and a half years before admission, complaining of anterior chest discomfort of five months' duration. One month before the onset of this symptom, he underwent a herniorrhaphy at another hospital. Physical examination revealed at that time a heart of normal size, but there was a blowing systolic murmur at the apex and a soft blowing diastolic murmur at the base and along the left sternal margin. X-ray films revealed no cardiac enlargement or evidence of aortitis. The electrocardiogram showed a PR interval of 0.3 second. The operation was carried out without difficulty, and convalescence was uneventful. About a month after the operation, he was awakened one night by a vague sensation of uncomfortable pressure across the anterior chest, which lasted half an hour. This sensation recurred about a week later, at which time he found that he was more comfortable sitting up than lying down. This episode also lasted about thirty minutes. A similar but less severe attack awakened him from sleep seven weeks before he saw his physician. He had had no other symptoms.

The past history revealed questionable rheumatic fever sixteen years previous to the onset of symptoms. His heart had been declared normal by an insurance company four years previously. He had had gonorrhea many years ago. He ate heavily and smoked moderately.

Physical examination by his physician revealed a slightly obese man in no distress. The eyes were normal. The maximal apical impulse was felt in the fifth interspace 10 cm. to the left of the midsternal line. The heart sounds were distant. A moderately loud blowing diastolic murmur was heard in the aortic area and at the apex. There were no thrills. The abdomen was negative. There was no edema of the lower extremities.

The pulse was 78, regular and full. The blood pressure was 140 systolic, 60 diastolic.

A blood Hinton test was negative. A chest plate showed a transverse heart with slight enlargement of the left ventricle. An electrocardiogram revealed normal rhythm, with a rate of 85. The PR interval was 0.28 second; T_1 was inverted, T_3 diphasic, Q_3 slightly prominent, and T_4 inverted.

The patient was advised to lose weight and reduce his smoking. He followed instructions and one month later had lost 14 pounds. During that time he had had no more attacks of chest discomfort and complained only of a little dyspnea.

The patient was again seen by his physician seven months later. He had felt well until a few weeks previously. At that time, he again began to have episodes of substernal discomfort at night, quickly relieved by nitroglycerin. Physical examination was unchanged.

One year later the patient reported that he had been troubled nightly by precordial discomfort, which awakened him but was relieved by nitroglycerin. The pulse was regular at 84. The blood pressure was 135 systolic, 45 diastolic. The heart sounds were fair, with a moderately loud aortic diastolic murmur. There was a questionable diastolic gallop at the apex.

Fifteen months later, he still complained of nightly substernal oppression, which was relieved by nitroglycerin or by sitting up. The pulse was regular at 84. The blood pressure was 150 systolic, 45 diastolic. The heart sounds were of poor quality. Slight systolic and moderate diastolic murmurs were heard in the aortic area. Fluoroscopy revealed no change.

A year later, the patient reported that nightly substernal oppression persisted. The heart sounds were again of poor quality, with Grade II systolic and Grade III diastolic murmurs at the aortic area. Fluoroscopy revealed that the heart was considerably larger than previously. The aorta was rather wide and blunt. The lungs were clear. There was edema of the extremities. At the time of admission to the hospital, four months after last seeing his physician, the patient stated that the substernal oppression had become more frequent and severer, occurring during exertion and at rest. Dyspnea was marked. About a week before admission edema appeared in the ankles and then became generalized. He had been given digitalis and Mercupurin, with little improvement.

The patient was dyspneic. The pupils were equal and reacted to light and accommodation. The heart was markedly enlarged to the left. The sounds were distant. The pulmonic second sound was greater than the aortic. There were slight aortic systolic and diastolic murmurs. The pulse was irregular, with many premature beats. The blood pressure was 120 systolic, 50 diastolic. There were rales in both lung bases. The liver was palpable two finger-

breadths below the right costal margin but was not tender. The ankles showed slight pitting edema.

The white-cell count was 13,000. The hemoglobin was 14.5 gm. The nonprotein nitrogen was 34 mg. per 100 cc. The spinal fluid was negative. An x-ray film of the chest showed considerable enlargement of the heart, particularly in the region of the left ventricle. There was some flattening of the apex, and the pulsations were somewhat diminished in this area. The aorta was tortuous but not definitely dilated. There was no calcification of the ascending portion. There was considerable enlargement of the pulmonary vascular shadow, with a tendency to a ground-glass appearance in the medial portions of the lung fields. There was a small amount of fluid in each pleural cavity.

An electrocardiogram showed a high-grade heart block, with frequent dropped beats. The PR interval varied from 0.35 to 0.44 second before the dropped beat. T_1, T_2 and T_3 were inverted; R was upright in CF_3; T was low in CF_4; and T was inverted in CF_5. A blood Hinton test was negative.

The day before death the patient began to have generalized convulsions associated with a slow pulse. Twenty-four hours after the onset of these convulsions he complained of severe substernal pain and had another convulsion. A few minutes later he expired, on the eleventh hospital day.

Differential Diagnosis

Dr. Conger Williams: There is a discrepancy in the record in that an abnormal heart was found at the time of operation, whereas nothing was found in an insurance examination a few months later. I shall discard the insurance company's findings.

May we see the x-ray films?

Dr. Milford D. Schulz: Only the films taken at the time of his admission to the hospital are available. The striking thing is the enlargement of the hilar and pulmonary vessels, and the diffuse haziness centrally placed in the lung fields. There is no fluid in the pleural sinuses.

Dr. Williams: Is this picture sometimes seen on the basis of nephritis alone?

Dr. Schulz: I do not believe that it means that; it is caused by pulmonary edema from any source. You can see it in nephritis and also in cardiac disease.

Dr. Williams: Presumably this man died with an Adams–Stokes syndrome; at least the slow pulse and convulsions suggest it.

This middle-aged man presented many significant features in the clinical course of his disease. Aortic valvular disease, with predominant regurgitation, was present for at least seven years. He had cardiac enlargement, which progressed to congestive failure, probably due for the most part to aortic regurgitation. He also had symptoms suggesting coronary insufficiency, which despite great severity persisted for the unusually long period of eight or nine years.

So far as the aortic valve disease is concerned, it was either syphilitic or rheumatic, and other possibilities, such as hypertension and erosion of cusps from infection, can be discarded. If it was syphilitic, the whole picture can be explained on the basis of one disease, which is a popular thing to do at these exercises. The record states twice that the blood Hinton test was negative, and that the spinal fluid was also negative. No mention of the blood Wassermann reaction was made, however, which means that the serologic investigation was incomplete. The highly sensitive Hinton test occasionally shows a prezone that occurs infrequently with the less sensitive Wassermann reaction. I can recall three cases in which the Wassermann test was positive but in which the Hinton test was negative until done in dilutions.

Dr. Tracy B. Mallory: That is most unusual, however. Nine times out of ten it works the other way.

Dr. Williams: So far as this case is concerned I am not willing to discard syphilis because of the negative Hinton tests. I should be more inclined to do so if blood Wassermann tests were known to be negative, but even that finding does not rule out syphilis.

If we assume that this man had syphilitic aortitis, the symptoms and findings of coronary insufficiency could be explained by the resultant narrowing of the orifices of the coronary arteries, although there is no reason why he should not have had coronary-artery disease in addition. At least it would be reasonable to suspect the presence of a syphilitic lesion involving the coronary mouths. X-ray studies might be helpful in that connection. Fluoroscopy reported flattening and localized diminution of pulsations at the apex. One often sees that in myocardial infarction, which of course produces localized muscle weakening, and it does occur with a large area of muscle atrophy and fibrosis following gradual occlusion of the coronary arteries by a syphilitic process.

If he had had rheumatic valvular disease to explain the regurgitation, it is perfectly reasonable to assume that he also had coronary-artery disease. The two are not infrequently associated. It is less easy to explain the prolonged PR interval on the basis of rheumatic infection, because such prolongation usually means an active process. Occasionally, however, prolongation may be permanent after a single attack of rheumatic fever. I should not suppose that this man had had active rheumatic fever over a period of eight or nine years.

So far as the cardiac findings are concerned, the aortic regurgitation alone accounts for most of them. With syphilitic occlusion of the mouths of the coronary arteries, an area of muscle might be sufficiently fibrotic or atrophic to account for localized diminution of the ventricular pulsations by fluor-

oscopy without actual infarction in the usual sense. Old myocardial infarction on a basis of ordinary coronary-heart disease is another possibility. So far as the symptom of coronary insufficiency — substernal discomfort — is concerned, there are several points of interest. One is that this symptom began over a year before his hospital admission, after the herniorrhaphy, was fairly acute, occurred even when he was in bed at night and then subsided. That is more or less characteristic of a good many cases of coronary insufficiency, especially if the onset is sudden and is preceded by coronary thrombosis. Of course, most of you know that the old concept of coronary insufficiency as a relentless ever-increasing process no longer holds. Dr. White and others* have shown that many cases undergo considerable improvement in their clinical status coincident with the development of a collateral coronary circulation. When such patients develop so-called "status anginosus," as this man did, they either go on having the symptoms of coronary insufficiency for days or weeks or they die during the episode of acute coronary insufficiency. I do not recall seeing a case in which so pronounced a state of coronary insufficiency existed for so long. This patient reported nightly substernal discomfort for at least two and possibly three years.

When one is presented with a history of this kind the first thing that comes to mind is the possibility of some complication to explain the unusual history. It is conceivable, although not usual, that syphilitic aortitis might produce progressive occlusion of both coronary mouths. In ordinary coronary-artery disease, probably the most important factor in improvement is the development of collateral circulation following occlusion of one of the major branches. If this process were syphilitic, involvement of both arteries at their mouths, in fairly static circumstances, might preclude collateral circulation and yet be compatible with life. Another thing that may contribute to coronary insufficiency is aortic regurgitation, with low diastolic pressure. This sometimes accounts for coronary insufficiency in patients with rheumatic heart disease. Most of the coronary flow takes place during diastole. Therefore, if the diastolic pressure is low, the coronary circulation may suffer accordingly. It is conceivable that the low diastolic pressure here might have been responsible in part for the high state of insufficiency of the coronary circulation.

What are the conditions outside the heart that may be responsible for an increase in the symptoms of pre-existing angina pectoris? It is well known that peptic ulcer, although not necessarily giving rise to symptoms, may prolong coronary symptoms or cause them to be felt in other than usual circumstances. The middle of the night is a good time for this to occur. Another frequent complication is gallbladder disease, but there is nothing here to suggest it. The symptoms of hiatus hernia are frequently present at night when the patient is reclining. Such a finding is not mentioned in the x-ray report, but the patient was too sick toward the end to have further investigation. Could he have had pain of this kind as a result of an unusual aneurysm that did not show up in the x-ray films? I doubt it. That diagnosis can be eliminated because of the nature of the pain and especially because of its long duration.

What about dissecting aneurysm? Syphilitic aortitis, if present, is supposed to be a fairly good insurance against dissecting aneurysm, presumably because of its cohesive effect on the layers of the aorta. A number of cases of dissecting aneurysm have been reported, however, in the presence of syphilitic aortitis. It is a rare possibility and need not be considered here.

I shall vote for syphilitic aortitis, with aortic regurgitation, cardiac enlargement, occlusion of the mouths of the coronary arteries, congestive failure, coronary insufficiency and, finally, death with an Adams–Stokes seizure. The question of myocardial infarction of the usual sort must be raised in addition.

Clinical Diagnosis

Coronary heart disease.

Dr. Williams's Diagnoses

Syphilitic aortitis.
Aortic regurgitation.
Cardiac enlargement.
Congestive failure.
Occlusion of mouths of coronary arteries, with localized muscle atrophy and fibrosis.
Coronary insufficiency (angina pectoris).
(Adams–Stokes syndrome.)
Atherosclerosis of coronary arteries, with old myocardial infarction?

Anatomical Diagnoses

Syphilitic valvulitis of aortic valve with insufficiency.
Coronary sclerosis with thrombosis.
Chronic passive congestion.
Pleural effusion, bilateral.

Pathological Discussion

Dr. Mallory: This patient showed a grossly hypertrophied heart, weighing 750 gm. There was a bilateral pleural effusion, which, I believe, can be attributed to passive congestion. The heart showed an abnormality of the aortic valve, characterized particularly by separation of the commissures. The cusps were thickened and shortened, and their points of attachment to the aortic ring were considerably below where they should be. There was

*White, P. D., Bland, E. F., and Miskall, E. W. Prognosis of angina pectoris: long time follow-up of 497 cases, including note on 75 additional cases of angina pectoris decubitus. *J. A. M. A.* 123:801-804, 1943.

a separation of 3 to 4 mm. between their points of attachment, whereas normal cusps should meet on the aortic wall within 1 mm. of each other. So far as I know that is an absolutely pathognomonic sign of syphilitic infection. The aorta immediately above the valve was quite smooth and beyond the arch it showed only ordinary atheroma. There was nothing that I could recognize grossly as being typical of syphilitic aortitis. A section, however, taken just above the commissure, showed focal degeneration of the media of the aorta. Both muscle fibers and elastic tissues were completely destroyed. There was not, however, any inflammatory infiltration, and the vasa vasorum did not show perivascular cuffing, which is usually seen in active syphilitic aortitis.

I believe that the findings justify a flat-footed diagnosis of syphilitic infection but that it was a completely burned-out inactive lesion, which no doubt is the reason for the negative serologic tests. As Dr. Williams has pointed out, it is characteristic in syphilis of the aortic valve to find the mouths of the coronary arteries narrowed by the process. That was not true in this case. Further down in the coronary system, however, in the descending and circumflex branches of the left coronary artery, were old organized thrombi, one of which was slightly recanalized and had again thrombosed. The thrombosis had resulted from atheromatous lesions and had nothing to do with the syphilis, which produced the aortic regurgitation. The myocardium showed irregular patchy fibrosis on microscopical examination but no gross areas of infarction.

CASE 32072

Presentation of Case

First admission. A twenty-four-year-old man was admitted to the Emergency Ward shortly after he had had a convulsive seizure.

He stated that he had had a similar seizure several years previously. At the time of admission he was lucid and oriented. The anterior portion of the tongue was lacerated. The pupils were round and equal and reacted to light and accommodation, and the fundi were normal. Neurologic examination was negative.

The temperature was 98°F., the pulse 90, and the respirations 20. The blood pressure was 136 systolic, 84 diastolic.

While in the Emergency Ward, the patient had another convulsion, which lasted about a minute and in which he bit his tongue and was incontinent of urine. Following the convulsion he remained unconscious for about five minutes, after which his mind was again perfectly clear. An electro-encephalogram showed variable waves, with individual frequencies and voltages within normal limits. An x-ray film of the skull was negative. He was discharged the following day, being advised to take 0.1 gm. of Dilantin twice a day and 0.1 gm. of phenobarbital three times a day.

Second admission (five months later). The patient was admitted in semicoma after several convulsions. Following discharge he had been symptom free until three months later, when he had one seizure. Eleven days before readmission he had two more seizures, and two days before admission he began to have seizures almost continuously. On entry he could be aroused only with difficulty. The tongue was scarred and showed recent lacerations. Examination was otherwise negative.

The temperature was 98.6°F., the pulse 100, and the respirations 20. The blood pressure was 125 systolic, 80 diastolic.

The patient was given 0.13 gm. of sodium luminal intramuscularly and had no convulsions during his stay in the Emergency Ward. He was discharged three days after admission, being advised to take 0.1 gm. of Dilantin and 0.03 gm. of phenobarbital four times a day.

Third admission (two weeks later). Soon after discharge the patient began to have constant, severe, throbbing headache in the frontal region and around the eyes. He vomited and was slightly drowsy and said that he had an occasional convulsive seizure. The convulsions usually started with movements of the eyes and then of the body and extremities. He would then fall down, usually on his right side, losing consciousness for one or two hours. He often bit his tongue, usually on the right side, and was incontinent.

Examination showed a papilledema measuring 2 diopters bilaterally and small hemorrhages at the edge of the left optic disk. There was slight peripheral constriction of the visual field of the left eye, and enlargement of the blind spots on both sides. The pupils were regular and equal and reacted to light and accommodation. The neck was slightly stiff. The reflexes were normal, and neurologic examination was negative.

An electroencephalogram showed a large amount of symmetrically distributed, low-voltage, slow activity, with no evidence of focal dysrhythmia. A ventriculogram showed the ventricles to be normal in size, shape and position. Lumbar puncture on the day following the ventriculogram revealed clear fluid under pressure equivalent to 650 mm. of water. The total protein was 28 mg. per 100 cc. Another ventriculogram, made through anterior burr holes, was negative.

The question of a so-called "pseudotumor cerebri" was raised, and subtemporal decompressions were performed, the one on the left being done on the fourteenth hospital day, and the one on the right on the twenty-seventh. On the nineteenth and thirty-sixth hospital days the peripheral visual

fields were normal except for enlargement of the blind spots, which remained unchanged. Visual acuity on the thirty-sixth day was 20/40 on the right, and 20/50 on the left (there were no reports on the fundi at that time). The craniotomies bulged, and the spinal-fluid pressure remained elevated (350 mm.). A combined ventriculoencephalogram on the forty-eighth hospital day was not satisfactory but seemed to be negative. The following day the patient was up and about and was discharged home.

When seen in the Out Patient Department one week after discharge there had been no headache. Visual acuity was 20/30 on the right, and 20/40 on the left. There was papilledema bilaterally — slight on the right and 3 to 4 diopters, with a fresh hemorrhage, on the left.

Fourth admission (eighteen days later). One and a half hours before admission the patient had a convulsive seizure, which began in his right hand, progressed up the arm and then became generalized, with loss of consciousness. The eyes were deviated to the right. The seizure lasted five minutes, and the patient felt well and appeared to be normal on admission. He was discharged on the following day, 0.1 gm. of Dilantin three times a day and 0.1 gm. of phenobarbital at night being prescribed.

Fifth admission (three months later). During his visits to the Out Patient Department, the choking of the left disk decreased but the headaches and frequent severe convulsions persisted. The patient was confused and mentally sluggish. The right optic disk was somewhat pale, but there was no definite papilledema on either side. The subtemporal decompressions were bulging. During his stay of three days in the hospital he had one convulsion. The Dilantin and phenobarbital were continued.

Final admission (two and a half months later). The patient took his medicine faithfully and remained well until two weeks before readmission, when he had another convulsion. Shortly after this seizure, he became stuporous and was taken to a hospital, where he was given injections "for convulsions." Four days before entry he became comatose, and two days later he began to have convulsions almost continuously. On admission he was comatose, breathing heavily. The decompressions were bulging and tense. The pupils were constricted and did not react to light. The eyes wandered continually. The tendon reflexes were hypoactive and equal; the plantar reflexes were normal.

The temperature was 104°F., the pulse 130, and the respirations 30. The blood pressure was 96 systolic, 50 diastolic.

Lumbar puncture yielded clear, colorless fluid under an initial pressure equivalent to 210 mm. of water. The total protein was 28 mg. per 100 cc.

A chest plate showed no abnormalities.

There were frequent convulsive movements, which were severer on the right than on the left. Sodium luminal (0.13 gm. subcutaneously) was given at intervals of one or two hours for six doses and after that every three to four hours, the total dosage being 1.43 gm. At a second lumbar puncture, the pressure was 190 mm. and the fluid was clear and colorless. The pulse, which remained rapid, diminished in strength and became irregular, respirations became gasping, the temperature rose to 108.5°, and the patient died thirty-two hours after admission.

Differential Diagnosis

Dr. William H. Sweet: We are not told whether the first part of the seizure was observed, but I presume that the report indicates the full amount of useful clinical data ascertained.

"He often bit his tongue, usually on the right side. . . ." This comment is the first suggestion of a lateralizing character in the description of the seizures. If he bit his tongue more frequently on the right than on the left, presumably the muscles on the left side were more active than those on the right. These muscles would be innervated from the right cerebral hemisphere.

I should like to see the x-ray films, because they often have crucial diagnostic significance in a case of this kind.

Dr. Clayton H. Hale: These first plain films were reported as negative. I do not see anything abnormal. The ventriculogram shows that almost all the ventricles are filled and that they are not displaced. I cannot be sure, however, that both anterior horns are completely filled. The third ventricle is normal. The fourth shows no defects.

Dr. Sweet: How about this shadow? Is it the anterior horn that did not fill well for some reason?

Dr. Hale: I believe so.

Dr. Sweet: It is materially behind one of the others.

Dr. Hale: Yes, and the same is true in this film. This is one anterior horn; the other apparently stops at this point. At least there is overlapping of the two ventricles.

Dr. Charles S. Kubik: Can you tell which it is?

Dr. Hale: I cannot be sure. This one looks smaller and should be the right one, because that was closer to the film. The posterior horns look all right. The bodies also look normal.

Dr. Sweet: The anterior horn stands out much better on the left side than on the right. That, of course, does not fit in with the one clearly described seizure that has the most localizing significance, namely, the one in which the patient was described as having a seizure that began in the right hand and extended up the arm.

In considering the lesions that produce increased intracranial pressure without producing any demonstrable deformity of the ventricular system, we are faced with a number of possibilities about which we know little. As far back as the turn of the cen-

tury Quincke[1] first described serous meningitis. In a number of his cases the cerebrospinal fluid was normal except for increased pressure and the patient's chief complaints were blurring of vision and headache, which were accompanied by papilledema. Groups of cases with similar syndromes have been recorded in the literature from time to time ever since, different diagnostic headings being used for each group. Passot,[2] a Frenchman, noted that in his group there was an increased amount of cerebrospinal fluid in the space overlying the cerebral hemispheres. He referred to it as meningeal hydrops. Davidoff and Dyke[3] reported 15 cases in which the same symptoms and signs were present. They referred to them, again, as cases of serous meningitis. Symonds[4] described another group of similar cases, using the term "otitic hydrocephalus" because they followed infection in the middle ear. McAlpine[5] described another group in which the symptoms followed infection around the nasopharynx, employing the name "toxic hydrocephalus." Dandy's[6] cases may be in this category; he sidestepped etiology and called them cases of "intracranial pressure without brain tumor." One feature has persisted in all the cases in the various series, that is, all the patients have appeared well generally, except for the few who had excessively high intracranial pressure. Even the cases with papilledema, at times with visual loss progressing to a severe degree, were up and about, and in almost none of these cases were there convulsive seizures, such as occurred in this case. I do not know what terminology we should give to this curious group or groups. Commonly such a patient is treated by bilateral subtemporal decompression, and many lumbar punctures following it. The increased intracranial pressure finally becomes normal. The fact that this patient on the last admission had bulging decompressions indicates that the pressure remained high. It has been suggested that a mechanism in the development of this syndrome may be extensive venous occlusion of many veins of the cerebral hemispheres or of one of the large intracranial venous sinuses; some of the cases coming to autopsy have, however, failed to confirm this theory. Davidoff and Dyke described one such apparent case in their series but found nothing abnormal in the brain. I have had a case in which I was sure that I was going to be able to confirm the venous-occlusion theory. The patient had had a spontaneous episode of axillary venous thrombosis a few months before her illness, which consisted of papilledema and increased intracranial pressure. A subtemporal decompression was performed, followed by multiple lumbar punctures; she was getting along very well but later developed pyogenic meningitis and died. I repeated the experience of Davidoff and Dyke, nothing being found in the brain to account for the patient's original increase in intracranial pressure. In the problem before us I cannot be positive that this patient did not have this obscure condition, but because of the long duration of symptoms and the convulsive seizures I am inclined to think that he probably did not.

There are a number of other diagnostic possibilities that can be excluded by the x-ray films. One is partial occlusion of the foramen of Magendie and Luschka, which can produce a syndrome of this type, but air introduced from below is not likely to fill the ventricular system in such cases as it did in this case. Furthermore, the ventricles are usually dilated, whereas they were not dilated here. A serous meningitis in which no cells are found in the spinal fluid has been described in epidemics. I have never seen such a case, and there is no similar group of cases recorded at the Massachusetts General Hospital. I think that we can exclude that possibility. Another condition, multiple arterial occlusions in the brain, which is perhaps similar to periarteritis nodosa, is seen in cases of temporal arteritis in which there is a severe papilledema, often with hemorrhages and exudates in the retinas and with marked increase in intracranial pressure and no lateralization of the cerebral lesion. There is no description to suggest other arterial disease in this patient that would fit in with this syndrome. It is exceedingly rare, and the long course that occurred in this patient has not been observed.

I come back to wonder about a localized space-taking lesion that was not demonstrated in any of the air studies that were made. Perhaps one of the most expert ventriculographers in the world is Lysholm,[7] who works with Olivecrona in Stockholm. He has missed, at initial examination, a few cases of small intracranial tumor. He makes multiple films, with appropriate positioning of the head, in an attempt to fill every portion of the ventricular system and the subarachnoid space. The tumors he has missed have been widely distributed — one in the temporal region, one in the occipital, one in the frontal lobe and one extremely small one, which had produced a seizure, in the region of the precentral gyrus. In two of my own cases the ventriculograms failed to reveal a tumor that was present. One was in the frontal region, and even on review of the x-ray films they were considered normal, with perfectly satisfactory filling of both frontal horns, as well as of the anterior parts of the bodies of the ventricles. The other tumor was in the medial part of the temporal lobe and had occurred despite normal filling of the temporal horns of the ventricles. In this case I am not satisfied that the anterior horns of the ventricles were filled on both sides. This is the largest area of brain relatively uninvaded by the ventricular system and one in which a small tumor can be present without producing any deformity of the ventricular system. It is an area of the brain in which spread of the nervous activity can soon reach the precentral gyrus, thus producing the single physical manifestation

that was recorded in this case. I favor the diagnosis of a frontal tumor. On careful examination of the stereoscopic views one might have been able to decide on which side this tumor was placed, but on the basis of the clinical history I should say that one ought to place more weight on the fact that the single localizing seizure began in the right hand than on the fact that the muscles of the left side of the tongue seemed to move more than those on the right. Hence, I think that it is likelier to have been a left frontal tumor than a right frontal tumor.

DR. AUGUSTUS S. ROSE: How do you explain the increased intracranial pressure?

DR. SWEET: Minute tumors can be associated with enough diffuse cerebral edema to produce a marked increase in pressure. We had one disturbing experience in a patient with a small astrocytoma that was demonstrated by a ventriculogram. Because of the exigencies of the operative procedures scheduled for that day, it was decided to defer craniotomy until the next day. She died the night of the ventriculogram. At autopsy a small astrocytoma was found in the frontal lobe; this was accompanied by a massive cerebral edema without hemorrhage.

CLINICAL DIAGNOSES

Brain tumor?
Status epilepticus.

DR. SWEET'S DIAGNOSES

Brain tumor, left frontal lobe.
Status epilepticus.

ANATOMICAL DIAGNOSES

Cerebral hemangioma, right frontal lobe.
(Status epilepticus.)

PATHOLOGICAL DISCUSSION

DR. CHARLES S. KUBIK: This case is extremely puzzling, and some of the clinical manifestations cannot be explained, even after the post-mortem examination. There was a marked flattening of the cerebral convolutions, but no pressure cone of any size. There was a small, dark, bluish-red elevation in the posterior part of the middle frontal convolution on the right side, which, when the brain was sectioned, showed up as a round brick-red lesion 2 cm. in diameter that looked like a small hemorrhage. The lateral ventricles, surprisingly enough, were not enlarged, but there was a marked difference in the size of the two hemispheres, the right measuring 9 cm. and the left 6.5 cm. in their maximum transverse diameters. The enlargement was present for a considerable distance both anterior and posterior to the lesion. Sections of the lesion showed microscopically a hemangioma made up of thin-walled vascular channels, the largest of which measured 1 mm. in diameter. Since the whole lesion was only about 2 cm. in diameter, it is surprising that it could have caused increased pressure and papilledema over so long a time, and such a marked enlargement of the hemispheres. It is possible that the hemangioma was considerably larger during life, owing to distention of the vascular channels with blood. I have seen a hemangioma on the surface of the spinal cord shrink to half or less of its original size during surgical removal.

Since the autopsy was limited to the head, the chief cause of death is somewhat uncertain. I should suppose, however, that it was related to the status epilepticus. In other cases dying in status epilepticus we have found congestion and edema of the lungs. In most cases that is apparently responsible for death rather than the cerebral lesion. It is therefore highly important to control the convulsions. The best results in my experience have been obtained by ether inhalation. This method I believe is as safe as any.

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ACTION AND REACTION

IT SEEMS to be a general law of nature that every action has its reaction, as the discharge of a gun is followed by the recoil. The seasons succeed one another, with winter as the inevitable reaction to summer; the rain and the sun each in turn exercise their influence in stimulating growth, seeming to oppose but actually complementing each other; the reed bows before the wind, then seeks its original position. So, in higher levels of activity, we appear to have compensating forces that can be depended on to oppose right actions and, eventually, to correct wrong ones. Only the wave lengths may vary: the reactions may be incredibly swift or, in the case of massive forces, we may have to wait long for them to manifest themselves.

At the moment we are in the midst of a postwar reaction that shocks us like a hammer blow — a depression marking the release of those moral forces, as we considered them, that had been confined and directed toward a single, presumably noble and unselfish, purpose. We knew at the time that this reaction would set in, but still we were unprepared for it when the war went out from under us.

That which we had accepted and on which we had depended as unselfish devotion to a noble cause gave way to the return, sometimes manyfold, of selfishness and greed. The issues on which we had taken our stand became confused; the goals that we had seemed to reach became as unreal as the rainbow's end. Each one saw, not a better world for himself and others, but the need for hurrying back into the old warren before someone else could reach it.

We see this precipitate abandonment of the ideals that we had thought we had in hand in the wave of labor difficulties that has swept the country; we see it in the dissatisfaction of our less seasoned veterans who clamor only to get home, and in the disgraceful and subversive activities that have been reported to us of men and officers alike still in foreign countries. We see it in many little ways, — in the petty selfishnesses and discourtesies of the highway, in the increased demands made on our own harassed profession and in the abandonment of those restraints that commitment to a common cause had placed on us, — and we know that our tide of common effort has reached its flood and has begun to run the other way.

It has become popular, too, in our free press, which can roar defiance like a lion when needed, to follow now in the footsteps of certain less regal animals. With a crying need for constructive effort in every direction, some of our editors seem more interested in digging up old bones to chew on and in indulging in what seems to us to be vicious anti-Russian propaganda. Our politics also, or our statesmanship, if you will, seems not now to be of the high order that our victories require to make the winning of them both justifiable and reasonably permanent. There is much with which we have a right to be discontented at the present time.

It is obvious that, to retain our faith in some sort of a desirable destiny for mankind, we must look beyond our disintegrated present to the inevitable counterreaction when we will again right ourselves, realize the inescapable responsibilities of existence and face the barriers between ourselves and a newer, higher goal. There is nothing in our past experience to deny such a belief; there is everything to confirm it. We are again merely witnessing the devious ways by which man works toward each successive achievement.

LICENSING OF OSTEOPATHIC PHYSICIANS IN MASSACHUSETTS

For the last thirty-seven years certain graduates of osteopathic schools have been permitted to practice osteopathy or medicine in Massachusetts. In view of recent changes in the statutes, it seems desirable to review the acts of the General Court that have governed such practice.

In 1909 the Legislature enacted a law that contains the following statement, "The terms osteopathy and osteopathic, as used in this act or in relation to the registration and practice of osteopathic physicians, shall have the same legal construction and meaning as the terms medicine and medical. . . ." Another section of this act states that persons registered under the act shall not be permitted to prescribe or administer drugs for internal use, or to perform major operations in surgery, or to engage in the practice of obstetrics, or to hold themselves out by virtue of such registration as and for other than osteopaths. The latter section applied to certain men who had been graduated from an osteopathic college, who had been practicing in Massachusetts for four years previous to the passage of the act and who wished to be registered as osteopaths and limit their practice to osteopathy. Some doctors took advantage of this law and continued to practice nothing but osteopathy, but probably few of them remain.

From 1909 until the middle of 1944 graduates of any medical school, osteopathic or regular, were eligible to take the examination of the Massachusetts Board of Registration in Medicine, irrespective of the quality of the school from which they had graduated. But in 1936 the so-called "Approving Authority Law" was passed, which stated that students who matriculated at a medical school on or after January 1, 1939, must have graduated from a school approved by the Approving Authority. The effective date was subsequently changed to January 1, 1941. This act also specified that, for the purposes of the Approving Authority, schools approved by the American Osteopathic Association and schools approved by the American Medical Association would receive the same consideration. It was because of the latter that the Approving Authority never did accept the list of the schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

At the last session of the Legislature, apparently because they feared that the Approving Authority never would approve osteopathic schools, the osteopaths introduced legislation to set up an osteopathic board of registration, but the bill was withdrawn. Finally, at the suggestion of the Committee on Education of the Legislature, a compromise bill was drawn and finally passed. The bill states that the Approving Authority shall be increased from three to five members, one member being the osteopathic member of the Board of Registration in

MASSACHUSETTS MEDICAL SOCIETY POSTWAR LOAN FUND

The Postwar Loan Fund has been set up, and all discharged medical officers who were members of the Massachusetts Medical Society in good standing at the time of their entry into the service may apply for loans from this fund. For further information apply to:

George L. Schadt, *Chairman*
Postwar Loan Fund
8 Fenway
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Medicine, who shall be a graduate of a school approved by the American Osteopathic Association and by the Approving Authority, and the other a layman.

On December 14, 1945, the newly designated Approving Authority took favorable action on two schools approved by the American Osteopathic Association, namely, the Kirksville College of Osteopathy and Surgery, Kirksville, Missouri, and the Philadelphia College of Osteopathy and Surgery, Philadelphia. This approval followed hearings at which representatives of both schools presented all the facts concerning the qualifications demanded by the Approving Authority for medical schools. The Approving Authority had previously denied approval to the Des Moines Still College of Osteopathy, Des Moines, Iowa, which is a school approved by the American Osteopathic Association, an action indicating that the Approving Authority has not been giving blanket approval to all schools approved by the American Osteopathic Association.

As a result of these changes in the law controlling the practice of medicine in the Commonwealth and the actions of the Approving Authority, all applicants for examination for registration who matriculated on or after January 1, 1941, must be graduates of medical schools or osteopathic schools that have been judged worthy of approval. It also means that, in the future, the people of Massachusetts who need medical attention will be given it by either osteopathic or regular physicians who have received a proper education.

NOTICES

INTENSIVE COURSE IN OPHTHALMOLOGY

The Ophthalmological Study Council offers an intensive course covering various aspects of ophthalmology and extending from April 1 to June 1. This is primarily intended for discharged medical officers, but any physician who is properly qualified may participate. No laboratory or clinical work will be included, instruction being carried out by lectures, required reading and seminars. The course has been arranged by the executive officers of the Council, — Drs. Walter B. Lancaster, S. Judd Beach, T. L. Terry and Trygve Gundersen and Colonel Phillips Thygeson, — with the help of a large group of prominent ophthalmologists from all parts of the country, and it has the approval of the Surgeons General of the Army and of the United States Public Health Service.

Further details are given on the advertising pages of this issue of the *Journal*. Additional information may be obtained from the Ophthalmological Study Council, 520 Commonwealth Avenue, Boston 15.

BOSTON UNIVERSITY COURSE FOR DISCHARGED MEDICAL OFFICERS

Boston University School of Medicine will offer a six months' course for medical officers who have been discharged from the armed forces. This course has been designed to provide opportunity for these men to acquaint themselves with recent advances in medicine, to prepare themselves for practice or to spend a short period advantageously while waiting for a hospital appointment. Teaching by the case method will be conducted on the wards and in the outpatient departments of the hospitals affiliated with the medical school, and in addition, regular teaching exercises will be held several times a week. Special conferences or seminars will be arranged as occasion arises.

Instruction in the following fields will be offered: internal medicine, general surgery, orthopedic surgery, obstetrics and gynecology, urology, otolaryngology and radiology. If there is a demand for instruction in the preclinical sciences, courses in these subjects may be arranged. The student is urged to spend the entire six months in one of the above fields, but arrangements can probably be made to permit a few students to divide their time between two or more of the fields listed above if they so desire.

The course will begin on March 15 and will extend to September 15. The tuition fee will be $375.00. Application for admission should be made by writing to the Office of the Dean, Boston University School of Medicine, 80 East Concord Street, Boston 18.

BOSTON SOCIETY OF BIOLOGISTS

A meeting of the Boston Society of Biologists will be held in the Amphitheater of the Peter Bent Brigham Hospital, Boston, on Wednesday, February 20, at 8 p.m.

PROGRAM

The Comparative Pathologic Physiology of Addison's Disease and Cushing's Syndrome. Dr. Edwin Kepler.

Studies on the Stress Response of the Adrenal Cortex in Man: The diurnal rhythm. Dr. Gregory Pincus.

Studies on the Stress Response of the Adrenal Cortex in Man: Anoxia and shock therapy. Dr. Hudson Hoagland.

SOUTH END MEDICAL CLUB

The next regular meeting of the South End Medical Club will be held at the headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston, on Tuesday, February 19, at twelve noon. Dr. Harlan F. Newton will speak on the subject "Surgery in Pulmonary Tuberculosis." Physicians are cordially invited to attend.

MASSACHUSETTS HOSPITAL ASSOCIATION

The Massachusetts Hospital Association will hold its annual meeting for the election of officers and such other business as may arise at the Hotel Statler on Monday, March 11, at twelve noon. This is to be a luncheon meeting.

NEW ENGLAND PATHOLOGICAL SOCIETY

The next meeting of the New England Pathological Society will be held on Thursday, February 21, at 8 p.m., in the amphitheater of the Peter Bent Brigham Hospital, Boston. The program is as follows:

Case Reports.

Liposarcoma. Drs. Austin L. Vickery and Robert Cataldo.

Fibrosarcoma of the Heart Valve. Drs. Ephraim Woll and Austin L. Vickery.

Homologous Serum Jaundice: A problem in the operation of a blood bank. Drs. I. Herbert Scheinberg, Charles A. Janeway and Thomas D. Kinney, with the assistance of Virginia S. Poole and Ianthe Taylor.

Skeletal Growth in Relation to Vitamin A Deficiency and Excess. Dr. S. B. Wolbach.

Short business meeting.

(*Notices continued on page xvii*)